

A REVISION OF THE GENUS TREPOBATES UHLER
(HEMIPTERA: GERRIDAE)

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Doctor of Philosophy

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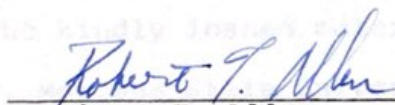
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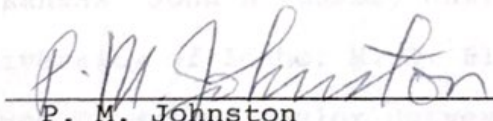
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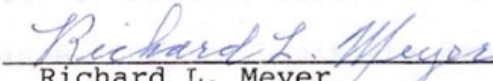
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TABLE OF CONTENTS

LIST OF FIGURES	i
LIST OF TABLES	xii
INTRODUCTION	1
General	1
Phylogeny	4
Life Histories	4
METHODS AND MATERIALS	7
General	7
Phylogeny	12
Life Histories	14
RESULTS AND DISCUSSION	16
<u>Trepobates Uhler</u>	16
Key to Sexes of <u>Trepobates</u>	23
Key to Apterous Males of <u>Trepobates</u>	23
Key to Apterous Females of <u>Trepobates</u>	26
<u>Trepobates becki</u> Drake and Harris	30
<u>Trepobates floridensis</u> Drake and Harris	41
<u>Trepobates inermis</u> Esaki	50
<u>Trepobates knighti</u> Drake and Harris	63
<u>Trepobates</u> n. sp. 1	80
<u>Trepobates</u> n. sp. 2	89
<u>Trepobates panamensis</u> Drake and Hottes	99
<u>Trepobates pictus</u> (Herrich-Schaeffer)	111
<u>Trepobates subnitidus</u> Esaki	127
<u>Trepobates taylori</u> (Kirkaldy)	160
<u>Trepobates trepidus</u> Drake and Harris	176
<u>Trepobates vazquezae</u> Drake and Hottes	194
Phylogeny	203
Life Histories	209
<u>Trepobates subnitidus</u>	209
<u>Trepobates knighti</u>	222
<u>Trepobates pictus</u>	232
SUMMARY	242
LITERATURE CITED	248

Figure	Page
17. Color pattern of male <u>T. floridensis</u> , Charlton Co., Georgia	47
18. Color pattern of male <u>T. floridensis</u> , Colquitt Co., Georgia	47
19. Color pattern of female <u>T. floridensis</u> , Charlton Co., Georgia	47
20. Color pattern of female <u>T. floridensis</u> , Santa Rosa Co., Florida	47
21. Color pattern of female <u>T. floridensis</u> , Dade Co., Florida	47
22. Lateral view of left middle femur of male <u>T. floridensis</u> , Charlton Co., Georgia	48
23. Dorsal profile of abdominal segment 8 of male <u>T. floridensis</u> , Charlton Co., Georgia	48
24. Left lateral view of abdominal segment 8 of male <u>T. floridensis</u> , Charlton Co., Georgia	48
25. Dorsal shaft of endosoma of <u>T. floridensis</u> , Charlton Co., Georgia	48
26. Left paramere of <u>T. floridensis</u> , Charlton Co., Georgia	48
27. Distribution of <u>T. floridensis</u>	49
28. Color pattern of male <u>T. inermis</u> , Litchfield Co., Connecticut	60
29. Color pattern of male <u>T. inermis</u> , Trumbull Co., Ohio	60
30. Color pattern of male <u>T. inermis</u> , Franklin Co., Kentucky	60
31. Color pattern of female <u>T. inermis</u> , Litchfield Co., Connecticut	60
32. Color pattern of female <u>T. inermis</u> , Trumbull Co., Ohio	60
33. Color pattern of female <u>T. inermis</u> , Franklin Co., Kentucky	60
34. Dorsal view of left antennal segment 3 of male <u>T. inermis</u> , Randolph Co., West Virginia	61

Figure		Page
35.	Lateral view of left middle femur of male <u>T. inermis</u> , Randolph Co., West Virginia	61
36.	Dorsal profile of abdominal segment 8 of male <u>T. inermis</u> , Ashtabula Co., Ohio	61
37.	Left lateral view of abdominal segment 8 of male <u>T. inermis</u> , Ashtabula Co., Ohio	61
38.	Dorsal shaft of endosoma of <u>T. inermis</u> , Ashtabula Co., Ohio	61
39.	Left paramere of <u>T. inermis</u> , Ashtabula Co., Ohio	61
40.	Distribution of <u>T. inermis</u>	62
41.	Color pattern of male <u>T. knighti</u> , Washington Co., Arkansas	77
42.	Color pattern of male <u>T. knighti</u> , Washington Co., Arkansas	77
43.	Color pattern of male <u>T. knighti</u> , Sabine Co., Texas	77
44.	Color pattern of female <u>T. knighti</u> , Story Co., Iowa	77
45.	Color pattern of female <u>T. knighti</u> , Washington Co., Arkansas	77
46.	Color pattern of female <u>T. knighti</u> , Sabine Co., Texas	77
47.	Left lateral view of abdominal segment 7 of female <u>T. knighti</u> , MacDonald Co., Missouri	78
48.	Left lateral view of abdominal segment 7 of female <u>T. knighti</u> , Scott Co., Illinois	78
49.	Left lateral view of abdominal segment 7 of female <u>T. knighti</u> , Iroquois Co., Illinois	78
50.	Dorsal profile of abdominal segment 8 of male <u>T. knighti</u> , Reynolds Co., Missouri	78
51.	Left lateral view of abdominal segment 8 of male <u>T. knighti</u> , Reynolds Co., Missouri	78
52.	Dorsal shaft of endosoma of <u>T. knighti</u> , Reynolds Co., Missouri	78

Figure	Page
53. Left paramere of <u>T. knighti</u> , Washington Co., Arkansas	78
54. Distribution of <u>T. knighti</u>	79
55. Color pattern of male <u>T. n. sp. 1</u> , Nayarit, Mexico	86
56. Color pattern of male <u>T. n. sp. 1</u> , Morelos, Mexico	86
57. Color pattern of female <u>T. n. sp. 1</u> , Morelos, Mexico	86
58. Color pattern of female <u>T. n. sp. 1</u> , Nayarit, Mexico	86
59. Color pattern of female <u>T. n. sp. 1</u> , Sinaloa, Mexico	86
60. Mesonotum of female <u>T. n. sp. 1</u> , Nayarit, Mexico	87
61. Dorsal view of left hind femur of female <u>T. n.</u> <u>sp. 1</u> , Sinaloa, Mexico	87
62. Dorsal profile of abdominal segment 8 of male <u>T.</u> <u>n. sp. 1</u> , Nayarit, Mexico	87
63. Left lateral view of abdominal segment 8 of male <u>T. n. sp. 1</u> , Nayarit, Mexico	87
64. Dorsal shaft of endosoma of <u>T. n. sp. 1</u> , Nayarit, Mexico	87
65. Left paramere of <u>T. n. sp. 1</u> , Sinaloa, Mexico . .	87
66. Distribution of <u>T. n. sp. 1</u>	88
67. Color pattern of male <u>T. n. sp. 2</u> , Veracruz, Mexico	96
68. Color pattern of male <u>T. n. sp. 2</u> , Veracruz, Mexico	96
69. Color pattern of male <u>T. n. sp. 2</u> , Consolacion del Sur, Cuba	96
70. Color pattern of female <u>T. n. sp. 2</u> , Veracruz, Mexico	96
71. Color pattern of female <u>T. n. sp. 2</u> , Veracruz, Mexico	96

Figure	Page
72. Color pattern of female <u>T. n. sp. 2</u> , Consolacion del Sur, Cuba	96
73. Posterior mesonotal projection of female <u>T. n. sp. 2</u> , Veracruz, Mexico	97
74. Posterior mesonotal projection of female <u>T. n. sp. 2</u> , Peten, Guatemala	97
75. Ventricle 7 of female <u>T. n. sp. 2</u> , Veracruz, Mexico	97
76. Dorsal profile of abdominal segment 8 of male <u>T. n. sp. 2</u> , La Salle Co., Texas	97
77. Left lateral view of abdominal segment 8 of male <u>T. n. sp. 2</u> , La Salle Co., Texas	97
78. Dorsal shaft of endosoma of <u>T. n. sp. 2</u> , La Salle Co., Texas	97
79. Left paramere of <u>T. n. sp. 2</u> , La Salle Co., Texas	97
80. Distribution of <u>T. n. sp. 2</u>	98
81. Color pattern of male <u>T. panamensis</u> , Cundinamarca, Colombia	108
82. Color pattern of male <u>T. panamensis</u> , Chiapas, Mexico	108
83. Color pattern of female <u>T. panamensis</u> , Chiapas, Mexico	108
84. Color pattern of female <u>T. panamensis</u> , Cundinamarca, Colombia	108
85. Color pattern of female <u>T. panamensis</u> , Nayarit, Mexico	108
86. Dorsal view of left hind femur of female <u>T. panamensis</u> , Chiapas, Mexico	109
87. Ventricle 7 of female <u>T. panamensis</u> , Cundinamarca, Colombia	109
88. Dorsal profile of abdominal segment 8 of male <u>T. panamensis</u> , San Vito de Java, Costa Rica	109
89. Left lateral view of abdominal segment 8 of male <u>T. panamensis</u> , San Vito de Java, Costa Rica	109

Figure	Page
90. Dorsal shaft of endosoma of <u>T. panamensis</u> , San Vito de Java, Costa Rica	109
91. Left paramere of <u>T. panamensis</u> , near L. Atescampa, Guatemala	109
92. Distribution of <u>T. panamensis</u>	110
93. Color pattern of male <u>T. pictus</u> , Providence Co., Rhode Island	123
94. Color pattern of male <u>T. pictus</u> , Middlesex Co., New Jersey	123
95. Color pattern of male <u>T. pictus</u> , Fulton Co., Georgia	123
96. Color pattern of female <u>T. pictus</u> , Litchfield Co., Connecticut	123
97. Color pattern of female <u>T. pictus</u> , Mercer Co., New Jersey	123
98. Color pattern of female <u>T. pictus</u> , Fulton Co., Georgia	123
99. Posterior mesonotal projection of female <u>T. pictus</u> , City of Falls Church, Virginia	124
100. Posterior mesonotal projection of female <u>T. pictus</u> , Pope Co., Illinois	124
101. Posterior mesonotal projection of female <u>T. pictus</u> , Adams Co., Mississippi	124
102. Posterior mesonotal projection of female <u>T. pictus</u> , Pike Co., Mississippi	124
103. Posterior mesonotal projection of female <u>T. pictus</u> , Cass Co., Texas	124
104. Lateral view of left middle femur of male <u>T. pictus</u> , Middlesex Co., New Jersey	125
105. Ventrite 7 of female <u>T. pictus</u> , Union Co., Illinois	125
106. Dorsal profile of abdominal segment 8 of male <u>T. pictus</u> , Washington Co., Arkansas	125
107. Left lateral view of abdominal segment 8 of male <u>T. pictus</u> , Washington Co., Arkansas	125

Figure	Page
108. Dorsal shaft of endosoma of <u>T. pictus</u> , Washington Co., Arkansas	125
109. Left paramere of <u>T. pictus</u> , Washington Co., Arkansas	125
110. Distribution of <u>T. pictus</u>	126
111. Color pattern of male <u>T. subnitidus</u> , Story Co., Iowa	157
112. Color pattern of male <u>T. subnitidus</u> , Washington Co., Arkansas	157
113. Color pattern of male <u>T. subnitidus</u> , Colorado Co., Texas	157
114. Color pattern of female <u>T. subnitidus</u> , Middlesex Co., New Jersey	157
115. Color pattern of female <u>T. subnitidus</u> , Guadalupe Co., Texas	157
116. Color pattern of female <u>T. subnitidus</u> , Massac Co., Illinois	157
117. Lateral view of left middle femur of male <u>T.</u> <u>subnitidus</u> , Story Co., Iowa	157
118. Left lateral view of abdominal segment 7 of female <u>T. subnitidus</u> , Trumbull Co., Ohio	158
119. Left lateral view of abdominal segment 7 of female <u>T. subnitidus</u> , Pope Co., Arkansas	158
120. Left lateral view of abdominal segment 7 of female <u>T. subnitidus</u> , Shannon Co., Missouri	158
121. Left lateral view of abdominal segment 7 of female <u>T. subnitidus</u> , Benton Co., Arkansas	158
122. Dorsal profile of abdominal segment 8 of male <u>T.</u> <u>subnitidus</u> , Trumbull Co., Ohio	158
123. Left lateral view of abdominal segment 8 of male <u>T. subnitidus</u> , Trumbull Co., Ohio	158
124. Dorsal shaft of endosoma of <u>T. subnitidus</u> , Trumbull Co., Ohio	158
125. Left paramere of <u>T. subnitidus</u> , Trumbull Co., Ohio	158

Figure	Page
126. Distribution of <u>T. subnitidus</u>	159
127. Color pattern of male <u>T. taylori</u> , Sinaloa, Mexico	173
128. Color pattern of male <u>T. taylori</u> , Zapata Co., Texas	173
129. Color pattern of male <u>T. taylori</u> , Oaxaca, Mexico	173
130. Color pattern of female <u>T. taylori</u> , Sinaloa, Mexico	173
131. Color pattern of female <u>T. taylori</u> , Quincemil, Peru	173
132. Color pattern of female <u>T. taylori</u> , Oaxaca, Mexico	173
133. Lateral view of left fore femur of male <u>T.</u> <u>taylori</u> , Val Verde Co., Texas	174
134. Mesosternum of female <u>T. taylori</u> , Val Verde Co., Texas	174
135. Dorsal profile of abdominal segment 8 of male <u>T.</u> <u>taylori</u> , Val Verde Co., Texas	174
136. Left lateral view of abdominal segment 8 of male <u>T. taylori</u> , Val Verde Co., Texas	174
137. Dorsal shaft of endosoma of <u>T. taylori</u> , Val Verde Co., Texas	174
138. Left paramere of <u>T. taylori</u> , Val Verde Co., Texas	174
139. Distribution of <u>T. taylori</u>	175
140. Color pattern of male <u>T. trepidus</u> , Sonora, Mexico	191
141. Color pattern of male <u>T. trepidus</u> , Oaxaca, Mexico	191
142. Color pattern of male <u>T. trepidus</u> , Sinaloa, Mexico	191
143. Color pattern of female <u>T. trepidus</u> , Baja California Sur, Mexico	191

Figure	Page
144. Color pattern of female <u>T. trepidus</u> , Oaxaca, Mexico	191
145. Color pattern of female <u>T. trepidus</u> , Sinaloa, Mexico	191
146. Lateral view of left fore femur of male <u>T. trepidus</u> , Sinaloa, Mexico	192
147. Ventricle 7 of female <u>T. trepidus</u> , Sinaloa, Mexico	192
148. Dorsal view of left hind femur of female <u>T. trepidus</u> , Baja California Sur, Mexico	192
149. Dorsal profile of abdominal segment 8 of male <u>T. trepidus</u> , Sonora, Mexico	192
150. Left lateral view of abdominal segment 8 of male <u>T. trepidus</u> , Sonora, Mexico	192
151. Dorsal shaft of endosoma of <u>T. trepidus</u> , Sonora, Mexico	192
152. Left paramere of <u>T. trepidus</u> , Sonora, Mexico	192
153. Distribution of <u>T. trepidus</u>	193
154. Color pattern of male <u>T. vazquezae</u> , Nayarit, Mexico	200
155. Color pattern of male <u>T. vazquezae</u> , Guerrero, Mexico	200
156. Color pattern of female <u>T. vazquezae</u> , Nayarit, Mexico	200
157. Color pattern of female <u>T. vazquezae</u> , Guerrero, Mexico	200
158. Lateral view of left fore femur of male <u>T. vazquezae</u> , Nayarit, Mexico	201
159. Dorsal profile of abdominal segment 8 of male <u>T. vazquezae</u> , Nayarit, Mexico	201
160. Left lateral view of abdominal segment 8 of male <u>T. vazquezae</u> , Nayarit, Mexico	201
161. Dorsal shaft of endosoma of <u>T. vazquezae</u> , Nayarit, Mexico	201

Figure

Page

162.	Left paramere of <u>T. vazquezae</u> , Nayarit, Mexico	201
163.	Distribution of <u>T. vazquezae</u>	202
164.	Hypothetical phylogeny for <u>Trepobates</u> spp.	208
165.	Egg mass of <u>T. subnitidus</u>	216
166.	Number of eggs/mass for <u>T. subnitidus</u>	217
167.	Incubation time of eggs of <u>T. subnitidus</u>	218
168.	Egg of <u>T. subnitidus</u> , day 9	219
169.	Color pattern of instar I of <u>T. subnitidus</u>	219
170.	Color pattern of instar II of <u>T. subnitidus</u>	219
171.	Color pattern of instar III of <u>T. subnitidus</u>	219
172.	Color pattern of instar IV of <u>T. subnitidus</u>	219
173.	Color pattern of instar V of <u>T. subnitidus</u>	219
174.	Number of eggs/mass for <u>T. knighti</u>	227
175.	Incubation time of eggs of <u>T. knighti</u>	228
176.	Egg of <u>T. knighti</u> , day 9	229
177.	Color pattern of instar I of <u>T. knighti</u>	229
178.	Color pattern of instar II of <u>T. knighti</u>	229
179.	Color pattern of instar III of <u>T. knighti</u>	229
180.	Color pattern of instar IV of <u>T. knighti</u>	229
181.	Color pattern of instar V of <u>T. knighti</u>	229
182.	Number of eggs/mass for <u>T. pictus</u>	237
183.	Incubation time of eggs of <u>T. pictus</u>	238
184.	Egg of <u>T. pictus</u> , day 9	239
185.	Color pattern of instar I of <u>T. pictus</u>	239
186.	Color pattern of instar II of <u>T. pictus</u>	239
187.	Color pattern of instar III of <u>T. pictus</u>	239

Figure	Page
188. Color pattern of instar IV of <u>T. pictus</u>	239
189. Color pattern of instar V of <u>T. pictus</u>	239

LIST OF TABLES

Table	Page
1. Duration (in days) of nymphal instars of seven male and six female <u>T. subnitidus</u>	230
2. Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female <u>T. subnitidus</u> exuviae	231
3. Duration (in days) of nymphal instars of two male and nine female <u>T. knighti</u>	235
4. Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female <u>T. knighti</u> exuviae	236
5. Duration (in days) of nymphal instars of four male and nine female <u>T. pictus</u>	240
6. Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female <u>T. pictus</u> exuviae	241

LIST OF TABLES

Table	General	Page
1.	Duration (in days) of nymphal instars of seven male and six female <u>T. subnitidus</u>	220
2.	Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female <u>T. subnitidus</u> exuviae	221
3.	Duration (in days) of nymphal instars of two male and nine female <u>T. knighti</u>	230
4.	Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female <u>T. knighti</u> exuviae	231
5.	Duration (in days) of nymphal instars of four male and nine female <u>T. pictus</u>	240
6.	Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female <u>T. pictus</u> exuviae	241

INTRODUCTION

General

The genus Trepobates is known only from the Western Hemisphere and includes twelve species. T. spp. are common inhabitants of the surface film of most bodies of water throughout their range; however, they are often overlooked by the casual collector because of their small size.

The first species was described from North America as Halobates pictus (Herrich-Schaeffer, 1848). White (1883) recognized that pictus was generically distinct from Halobates and placed it in a new genus, Stephania. Because Stephania was preoccupied in Lepidoptera, Uhler (1894) proposed the name Trepobates as a replacement. Kirkaldy (1899) described a new genus, Kallistometra, for K. taylori from Jamaica; however, Drake and Harris (1932a) suppressed the genus Kallistometra because it was identical to the genus Trepobates and stated that their T. comitalis, described from Grenada (Drake and Harris, 1928a), was a synonym of T. taylori. T. inermis and subnitidus were described from Maryland and Indiana, respectively (Esaki, 1926); these two species had previously been confused with T. pictus. T. trepidus and knighti were recognized as new by Drake and Harris (1928b). Drake and Harris (1928c) described T. flori-

densis from Florida. In a survey of the species of Trepobates, Drake and Harris (1932b) published a key to the species and presented redescrptions of seven species and a description of a previously undescribed species, T. becki; however, they failed to properly discriminate between T. inermis and subnitidus, and their key included T. comitalis (=taylori). T. vazquezae and panamensis were described by Drake and Hottes (1951a and 1952, respectively). Drake and Chapman (1953) properly distinguished T. inermis and subnitidus and described T. citatus from Florida and Mississippi. T. citatus is herein considered a synonym of T. subnitidus. Froeschner (1962) recognized an undescribed form of Trepobates from Missouri in which the males were indistinguishable from the males of T. subnitidus; the females of the two forms were distinct. This new form is herein considered to be a morphological variant of T. subnitidus. Two undescribed species are recognized in the present paper.

Several papers have been published which deal, at least in part, with Trepobates of specific geographical areas and these include the following: Connecticut (Torre-Bueno, 1923); Indiana (Deay and Gould, 1936a); Dallas County, Texas (Millspaugh, 1939); northern Florida (Herring, 1950, 1951); southeastern Louisiana (Ellis, 1952); California (Usinger, 1956); Mississippi (Wilson, 1958); New Jersey (Chapman, 1959); Netherlands Antilles (Cobben, 1960); Missouri (Froeschner, 1962); Argentina (Bachmann, 1963); Peru (Roback, 1966); Oklahoma (Schaefer and Drew, 1968); Ontario (Cheng and

Fernando, 1970); Venezuela and Brazil (Nieser, 1970); Cuba (Alayo, 1974); Virginia (Bobb, 1974); Louisiana (Gonsoulin, 1974); Colombia (Roback and Nieser, 1974); and northwest Arkansas (Kittle, in press). Unfortunately, many of these papers contain misidentifications, and therefore much of the included information is of limited value.

The major objective of this study is to provide a revision of the genus Trepobates which includes taxonomy, morphology, biology, distribution, and phylogeny of the group. Because most of the species of Trepobates are of approximately the same size, color, and form, they have been confused in collections and in the literature (Drake and Chapman, 1953). For many years, several species were confused with T. pictus, and references to this species in the literature often include more than one species or do not even include the true pictus. The descriptions of T. inermis and subnitidus (Esaki, 1926) removed some of this confusion; nevertheless, the failure of Drake and Harris (1932b) to properly discriminate between T. inermis and subnitidus in their key led to the confusion of these two species. Even though Drake and Chapman (1953) properly distinguished T. inermis and subnitidus, confusion of these two species has persisted to the present. The new keys, illustrations, and descriptions presented in this revision will hopefully enable other workers to more accurately identify Trepobates and alleviate the confusion discussed above. The distributions of the species of Trepobates are

Spring Lake, Minnesota, in the summer of 1923; however, pictus was the only described species of Trepobates at that time. I have examined specimens from Spring Lake, Minnesota, collected in August, 1923, by Hoffman, and determined as T. pictus by Hoffman. These specimens are T. subnitidus and not pictus; thus, Hoffman's life history observations apply to the former species. Measurements of body length, antennal segments, and leg segments of the nymphs and adults of T. knighti were presented by Matsuda (1960). The lake habitat from which specimens were said to have been collected, in addition to the measurements of female antennal segments presented, indicate that Matsuda actually was studying T. subnitidus and not knighti. Matsuda (1962) presented measurements of antennal and leg segments for all stages of T. pan-amensis and trepidus, and also figured the nymphs and adults for these species. Bobb (1974) figured the prothorax and mesothorax of the third instar nymph of T. inermis and pictus and gave body length measurements of T. inermis nymphs. From Bobb's description of inermis, however, it appears that his treatment of T. inermis nymphs actually applies to T. subnitidus.

Valuable taxonomic information is often produced by life history studies. Because of past and present confusion of species within the genus Trepobates, most preceding life history studies on T. spp. are of limited value. One of the purposes of the present paper is to contribute to our knowledge of the life histories of T. subnitidus, knighti,

METHODS AND MATERIALS

General

Both alcohol-preserved and pinned individuals of all species were examined. All specimens personally collected were preserved in 70% ethanol, and representative series were later mounted on points. Natural history data were compiled from personal observations, the literature, and information on specimen labels. Drawings were made with the aid of a Whipple ocular micrometer.

This study was based upon the examination of 16,136 specimens obtained by personal collection and through loans from various institutions and individuals. The following abbreviations are used in parentheses throughout this paper to indicate the source of specimens:

AMNH	American Museum of Natural History
ANSP	Academy of Natural Sciences, Philadelphia
ASU	Arizona State University
BMNH	British Museum of Natural History
BPBM	Bernice P. Bishop Museum
BU	Baylor University
CAS	California Academy of Science
CNC	Canadian National Collection
CSU	Colorado State University
CU	Cornell University

CUSC	Clemson University, South Carolina
DMNH	Dayton Museum of Natural History
FAMU	Florida A&M University
FMNH	Field Museum of Natural History
FSCA	Florida State Collection of Arthropods
GLH	George L. Harp
HCC	Harold C. Chapman
HNHM	Hungarian Natural History Museum
INHS	Illinois Natural History Survey
ISU	Iowa State University
JCS	Joseph C. Schaffner
JTP	John T. Polhemus
KSU	Kansas State University
LACM	Los Angeles County Museum
LEM	Lyman Entomological Museum
LSU	Louisiana State University
MSU	Mississippi State University
MSUB	Montana State University, Bozeman
MSUM	Memphis State University, Memphis
MUO	Miami University, Oxford
MWS	Milton W. Sanderson
NAU	Northern Arizona University
NN	Nico Nieser
OSU	Ohio State University
OSUC	Oregon State University, Corvallis
OSUS	Oklahoma State University, Stillwater
OU	Oxford University

PC	Providence College
PDK	Paul D. Kittle
PU	Purdue University
RET	Roger E. Thibault
RTM	Randall T. Morton
RU	Rutgers University
SCSC	St. Cloud State College
SDSU	South Dakota State University
SIU	Southern Illinois University
TAMU	Texas A&M University
UA	University of Arkansas
UBC	University of British Columbia
UCB	University of California, Berkeley
UCD	University of California, Davis
UCR	University of California, Riverside
UCS	University of Connecticut, Storrs
UG	University of Georgia
UI	University of Idaho
UK	University of Kentucky
UKL	University of Kansas, Lawrence
UMAA	University of Michigan, Ann Arbor
UMC	University of Missouri, Columbia
UMSP	University of Minnesota, St. Paul
UNH	University of New Hampshire
UO	University of Oklahoma
URI	University of Rhode Island
USNM	United States National Museum

USU Utah State University
UWM University of Wisconsin, Madison
VPI Virginia Polytechnic Institute
WSU Washington State University
YU Yale University

Measurements.— All measurements were made with the aid of a calibrated ocular micrometer and are expressed in millimeters (mm). Total length was measured from the anterior margin of the head to the posterior tip of the genitalia. Specimens with abnormally distended or withdrawn genitalia were not used for total length measurements. Interocular space measurements were taken across the shortest distance between eyes. Width was measured across the widest part of the mesothorax. Pronotal and mesonotal lengths were taken along the dorsal midline. The longest length of all segments was measured; the intercalary antennal segments were not included in the measurements. All measurements represent at least 10 individuals; however, any measurements used for taxonomic purposes represent 25 or more individuals. The range of each measurement is given first with the mean in parentheses.

Genitalia.— Alcohol-preserved specimens were used for dissection of the genitalia. These parts were removed from the specimen by inserting a Minuten pin between the seventh and eighth abdominal segments and tearing the connecting membrane. The genital segments were then placed in glycerin on a depression slide where they were dissected. The eighth

abdominal segment, dorsal shaft of the endosoma, and left paramere were placed in glycerin jelly for drawing. The paramere was always rotated so that the apical curved portion was horizontal. The terminology for the genitalia is that used by Matsuda (1960).

Identification Procedures.— The proper observation of some key characters requires careful examination. The long hairs on the third antennal segment of some males often become appressed to the segment in dried material and are very difficult to see; these hairs are most easily seen from a dorsal aspect. The middle femora of some males also have long hairs which may become appressed or broken. The apical constriction of the fore femora of some males is easily observed if the segment is examined from the proper perspective. The apparent shape of the paramere changes significantly as it is rotated; for consistency, the paramere should be rotated so that the apical curved portion is horizontal because all drawings were made with the paramere in this position. The shape of the seventh ventrite in females is variable with the method of preservation. Color patterns are sometimes extremely variable and must be used with caution in identification; however, each species exhibits a basic pattern which is often valuable taxonomically, especially when examining specimens that have lost appendages. Color variations within each species are illustrated.

Phylogeny

The basic tenets used in establishing the phylogenetic relationships of the species of Trepobates are those given by Allen (1972) as follows:

"1. The derived and ancestral states of at least some characters are postulated after a study of taxa believed to be closely related to the taxon under consideration.

2. Utilizing these characters a hypothetical ancestor is postulated for the group with which one is working.

3. It must be assumed that derived states of characters which are found in the group of organisms under study came about through a logical and orderly progression from ancestral to derived.

4. The various species of the group are compared with one another and those sharing derived characters in common are tentatively assumed to have risen from a common ancestor.

5. On a strictly logical basis, species are grouped into distinctive phylogenetic lines arising from a common ancestor only on the basis of shared characters.

6. Derived characters must originate from ancestral characters and not the opposite.

7. One must strive to account for all the derived conditions of the characters the least number of times."

Matsuda (1960) placed the genus Trepobates in the subfamily Trepobatinae; other taxa within this subfamily which were examined are listed below:

Genus Cryptobates Esaki

C. kuiterti Hungerford and Matsuda
C. raja (Distant)

Genus Halobatopsis Bianchi

H. platensis (Berg)
H. spiniventris Drake and Harris

Genus Hynesionella Poisson

- H. omer-cooperi Hungerford and Matsuda
H. sp.

Genus Metrobates Uhler

- M. alacris Drake
M. anomalus Hussey
M. artus Anderson
M. denticornis (Champion)
M. fugientis Drake and Harris
M. hesperius Uhler
M. laudatus Drake and Harris
M. plaumanni Hungerford
M. porcus Anderson
M. trux (Torre-Bueno)
M. tumidus Anderson

Genus Metrobatopsis Esaki

- M. flavonotatus Esaki
M. solomonensis Hungerford and Matsuda
M. sp.

Genus Naboandelus Distant

- N. bergevini Bergroth
N. sp.

Genus Ovatametra Kenaga

- O. fusca Kenaga
O. minima Kenaga
O. obesa Kenaga

Genus Rheumatometra Kirkaldy

- R. philarete Kirkaldy
R. sp.

Genus Rheumatometroides Hungerford and Matsuda

- R. browni Hungerford and Matsuda

Genus Telmatometra Bergroth

- T. acuta Kenaga
T. fusca Kenaga
T. indentata Kenaga
T. parva Kenaga
T. retusa Kenaga
T. ujhelyi Esaki
T. whitei Bergroth

Genus Trepobatoides Hungerford and Matsuda

T. boliviensis Hungerford and Matsuda

The character states in these closely related taxa were determined and used to ascertain the ancestral and derived states of various characters in Trepobates.

Life Histories

Life history studies were conducted under laboratory conditions during the summer of 1974. The sources of adult specimens for the initial cultures were as follows: T. subnitidus— pond 4 miles southwest of Springdale; T. knighti— Farmington Branch at Farmington, Illinois River 3.5 miles north of Prairie Grove, and Hamstring Creek 1.5 miles south of Wheeler; and T. pictus— Wildcat Creek 2 miles west of Harmon. All localities are in Washington County, Arkansas. Specimens were transported to the laboratory in small plastic buckets, the bottoms of which were covered with wet paper towels.

Three sizes of containers were used for rearing. Two kinds of culture dishes, 4.5 cm X 11.5 cm and 6.5 cm X 20 cm, were used as containers for adults. A dish of equal size was inverted over the container to prevent their escape. Nymphs were reared in specimen jars of 120 cc capacity, and a single nymph was placed in each jar. Nymphs were prevented from escaping by securing a small square of cheesecloth over the mouth of the jar with a rubber band. All culture vessels were filled to one-half of capacity with distilled water. No aeration was provided, but water was changed approximately

every 10 days to prevent formation of surface scum. Small pieces of styrofoam and halves of a #4 cork cut longitudinally were placed in the cultures to provide oviposition sites. Because eggs laid on the smoother surfaces of the corks were easier to observe than eggs laid on styrofoam, corks were usually provided.

Both nymphs and adults were fed frozen wild type Drosophila melanogaster. One fly per day was provided to each organism and uneaten flies were removed daily. Cultures were examined daily for the presence of eggs or exuviae. Eggs were transferred to separate containers for hatching, and exuviae were preserved in 70% ethanol. Transfer of bugs from one container to another was usually accomplished by holding the two vessels in close proximity and forcing the strider to jump into the new vessel, but an aquarium dip net was occasionally used for transferal. Water striders were raised at ambient laboratory temperature (mean 23°C, range 19-27°C). Measurements were made of eggs and antennal and leg segments of 10 exuviae from each instar (five male, five female).

RESULTS AND DISCUSSION

Trepobates Uhler

Stephania White, 1883:79.

Trepobates Uhler, 1894:213; Bianchi, 1896:70; Kirkaldy, 1906:156; Bergroth, 1908:373; Kirkaldy and Torre-Bueno, 1908:212; Torre-Bueno, 1911:245; Van Duzee, 1917:430; Hungerford, 1919:114; Hussey, 1919:10; Torre-Bueno, 1923:662; Blatchley, 1926:985; Esaki, 1926:139; Drake and Harris, 1932a:112; Drake and Harris, 1932b:113; Deay and Gould, 1936a:766; Kenaga, 1941:170; Kenaga, 1942:137; Herring, 1951:154; Drake and Hottes, 1952:35; Drake and Chapman, 1953:109; Usinger, 1956:213; Hungerford and Matsuda, 1958:125; Wilson, 1958:131; Hungerford, 1959:963; Hungerford and Matsuda, 1960:6; Matsuda, 1960:337; Froeschner, 1962:209; Bachmann, 1966:213; Cheng and Fernando, 1970:8; Nieser, 1970:97; Alayo, 1974:47; Bobb, 1974:72; Gonsoulin, 1974:515; Hilsenhoff, 1975:18.

Kallistometra Kirkaldy, 1899:28; Kirkaldy, 1906:155; Kirkaldy and Torre-Bueno, 1908:212.

Callistometra, Bergroth, 1908:372.

Diagnosis.— The genus Trepobates can be diagnosed by the following characters: (1) the metacetabular suture in apterous forms extends dorsally to the posterior margin of

the mesonotum and forms a secondary definitive intersegmental suture between the mesonotum and metanotum; (2) first abdominal ventrite absent; (3) hind femur distinctly shorter than body length; (4) intersegmental suture between mesonotum and metanotum not carinated; (5) first antennal segment subequal to or shorter than second and third segments united; (6) first tarsal segment of middle leg distinctly less than twice as long as second tarsal segment of middle leg; (7) third antennal segment less than one and one-half times as long as second, distinctly shorter than first; (8) omphalium absent; (9) mesopleuron with a distinct black, brown, or yellow longitudinal stripe; (10) middle tibia about as long or a little longer than body length; (11) eye does not extend beyond middle of propleuron in lateral view; and (12) hind tibia distinctly less than twice as long as hind tarsus.

Description.— HEAD: Marked with black and light yellow or yellow-orange, usually with a median longitudinal stripe which is expanded posteriorly. Eyes exserted, in close contact with anterolateral angles of pronotum. Eye not extending beyond middle of propleuron in lateral view. Interocular space widened posteriorly. Antennae slender, four-segmented, not highly modified; segment 1 slightly bowed at base, segments 2-4 straight, 3 with several long hairs in males of some species; segment 1 distinctly shorter than or subequal to segments 2 and 3 united in males, 1 distinctly shorter than 2 and 3 united in females; segment 2 shortest in most species, subequal to or distinctly shorter than 3; seg-

ment 4 distinctly longer than or subequal to 3. Rostrum four-segmented, reaching to anterior portion of mesosternum; segments 1 and 2 very short; 3 longest, about twice as long as 4 and with a few moderately long hairs dorsally; 4 glabrous.

PROTHORAX: Pronotum marked with black and light yellow or yellow-orange; about twice as wide as long and subquadrangular in shape; narrower than head including eyes and with anterior and posterior margins nearly straight in apterous form, prolonged posteriorly over the mesonotum in macropterous form. Fore legs relatively short. Fore femur slightly to strongly bowed near middle in males, slightly bowed near base in females, with an apical constriction or swelling in males of some species; femur 1.33-1.5 times as long as tibia. Fore tibia slightly bowed in males of most species, straight in females; a dense patch of very short, dark hairs at inner apex in both sexes. Anterior tarsus two-segmented; segment 2 four to six times as long as segment 1.

MESOTHORAX: Mesonotum marked with black and light yellow or yellow-orange; 1.25-1.75 times as wide as long and subquadrangular in shape, 1.6-4.0 times as long as pronotum; without a median longitudinal sulcus; with anterior and posterior margins nearly straight except that in some species the females have a median posterior prolongation; a mesopleural spot posterior to the black postocular stripe of the pronotum present in some species; patches of hairs present along the mesonotal-mesopleural line in females of most

species; with a small patch of hairs along the posterior margin in females of some species. Mesosternum usually unicolorous, with paired brown spots sometimes present in some species. Middle legs longest. Middle femur much thicker than tibia; males with a thick ventral fringe of hairs which, at maximum length, range from 20-120% of the diameter of the femur in different species. Middle tibia in males with a single ventral row of hairs along basal one-fourth to one-half which range from 25-160% of the diameter of the tibia in different species; tibia 1.75-2.0 times as long as femur, 0.9-1.2 times as long as body length. Middle tarsus two-segmented, thin; segment 1 1.1-1.3 times as long as segment 2.

METATHORAX: Metanotum usually marked with black and light yellow or yellow-orange, sometimes entirely black; short, subquadrangular in shape, defined laterally by a longitudinal elevation continuous from abdominal connexivum; a median patch of long hairs present in females of some species. Metasternum short, without omphalium, usually pale yellow or yellow-orange but sometimes brown in some species. Hind legs relatively long. Hind femur with a fringe of long hairs along basal inner margin in females of some species; 1.75-2.1 times as long as tibia. Hind tibia 1.4-1.6 times as long as hind tarsus. Hind tarsus two-segmented; segment 1 1.3-1.8 times as long as segment 2.

ABDOMEN: Short, gradually narrowed posteriorly. First and second abdominal tergites with anterior margins produced

anteriorly, anterior margin of first tergite often indistinct medially; tergites usually with black and light yellow or yellow-orange markings, sometimes entirely black; tergites usually covered, at least in part, with gray-blue bloom. Ventriles pale yellow or yellow-orange, with dark brown often present along anterior edges and sides; first ventrite absent; posterior ventrites with long pubescence in males of some species; seventh ventrite with a row of long hairs along posterior margin in females of some species. Connexival segments usually black with light yellow or yellow-orange markings, sometimes all black; lateral margins of some segments hairy in most species; connexiva in females of some species produced into short or long spines posteriorly.

GENITALIA: Eighth abdominal segment in males not highly modified, slightly concave on dorsal posterior margin, with pubescence or long hairs ventrally. Eighth abdominal segment in females divided longitudinally into two halves. Suranal plate largely hidden by eighth abdominal segment. Posterior one-half of pygophore exposed; pygophore with pubescence or long hairs ventrally. Endosoma with dorsal, ventral, and lateral plates or shafts. Parameres not greatly enlarged, always hook-like.

SIZE: Lengths of known species range from 2.5-4.1 mm in males and 3.0-4.8 mm in females. Widths of known species range from 1.0-1.6 mm in males and 1.4-2.1 mm in females.

Type Data.— The type species is Trepobates pictus (Herrich-Schaeffer), as designated by Uhler (1894) when he

erected the genus Trepobates.

Natural History.— The various species of Trepobates are common inhabitants of a wide variety of lentic and lotic habitats throughout the range of the genus. They have been commonly collected with Rheumatobates spp., Gerris spp., and Limnogonus spp. Species which occupy temperate regions are found from spring through autumn and apparently overwinter in the egg stage; however, in the tropical portion of the range Trepobates spp. are found during all seasons. Food apparently consists primarily of adult aquatic and terrestrial arthropods which have fallen into the water. Although mites have rarely been found on individuals of some species, it is not known whether these are parasitic or phoretic. One instance of predation on Trepobates by another water strider, Gerris remigis, is given below, but no other predators of Trepobates have been reported. Wing dimorphism occurs in all species, but the apterous form usually predominates. Macropterous specimens often have the apical half of the wings broken off, and Torre-Bueno (1908a) postulated that macropterous adults shorten their wings by breaking off the apical portions with their legs in order to facilitate breeding. The life histories of three species are presented in a later section.

Distribution.— The various species of the genus are found in southern Canada, eastern and southwestern United States, Central America, northern South America, and the West Indies (Fig. 1).

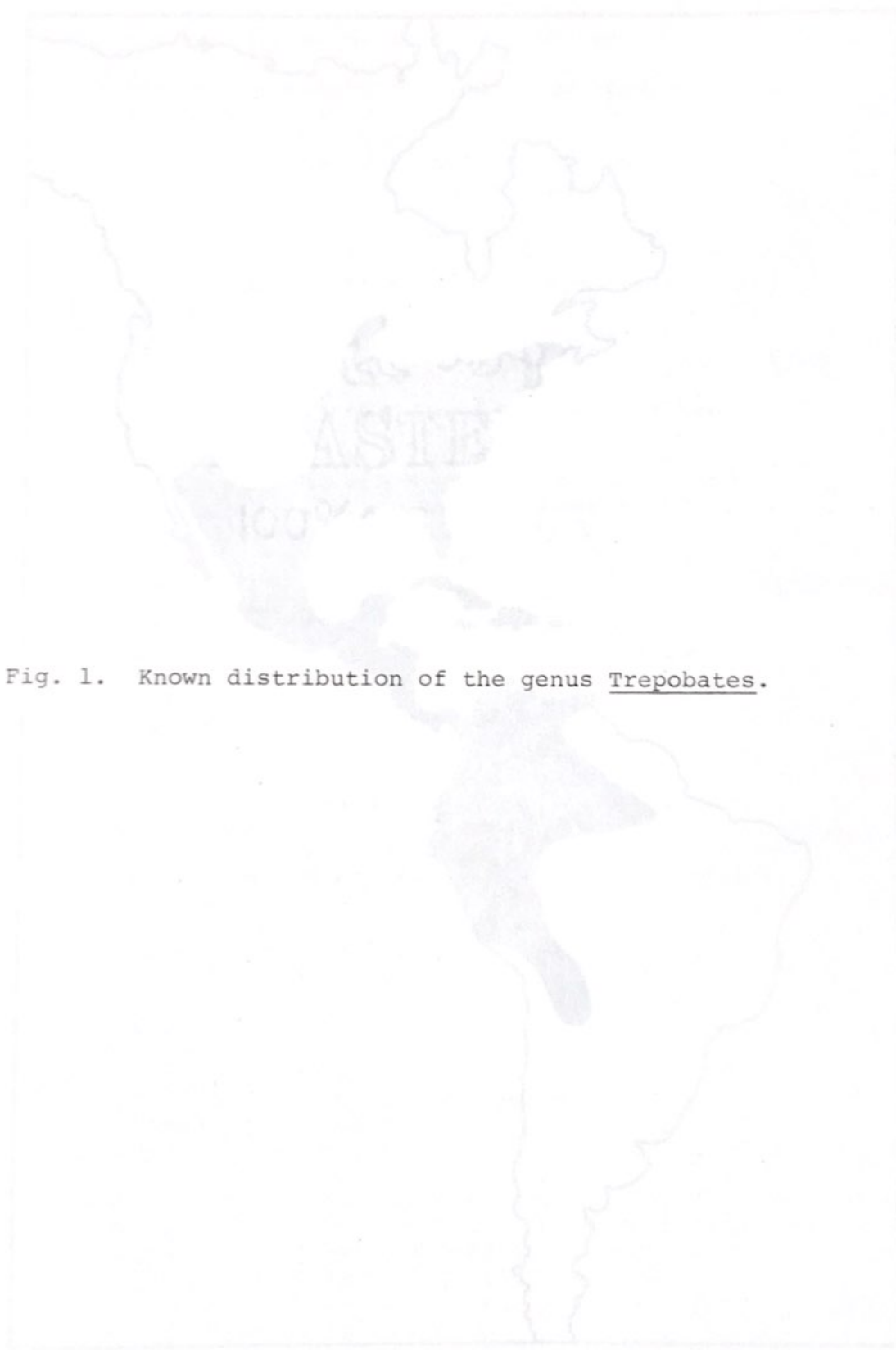
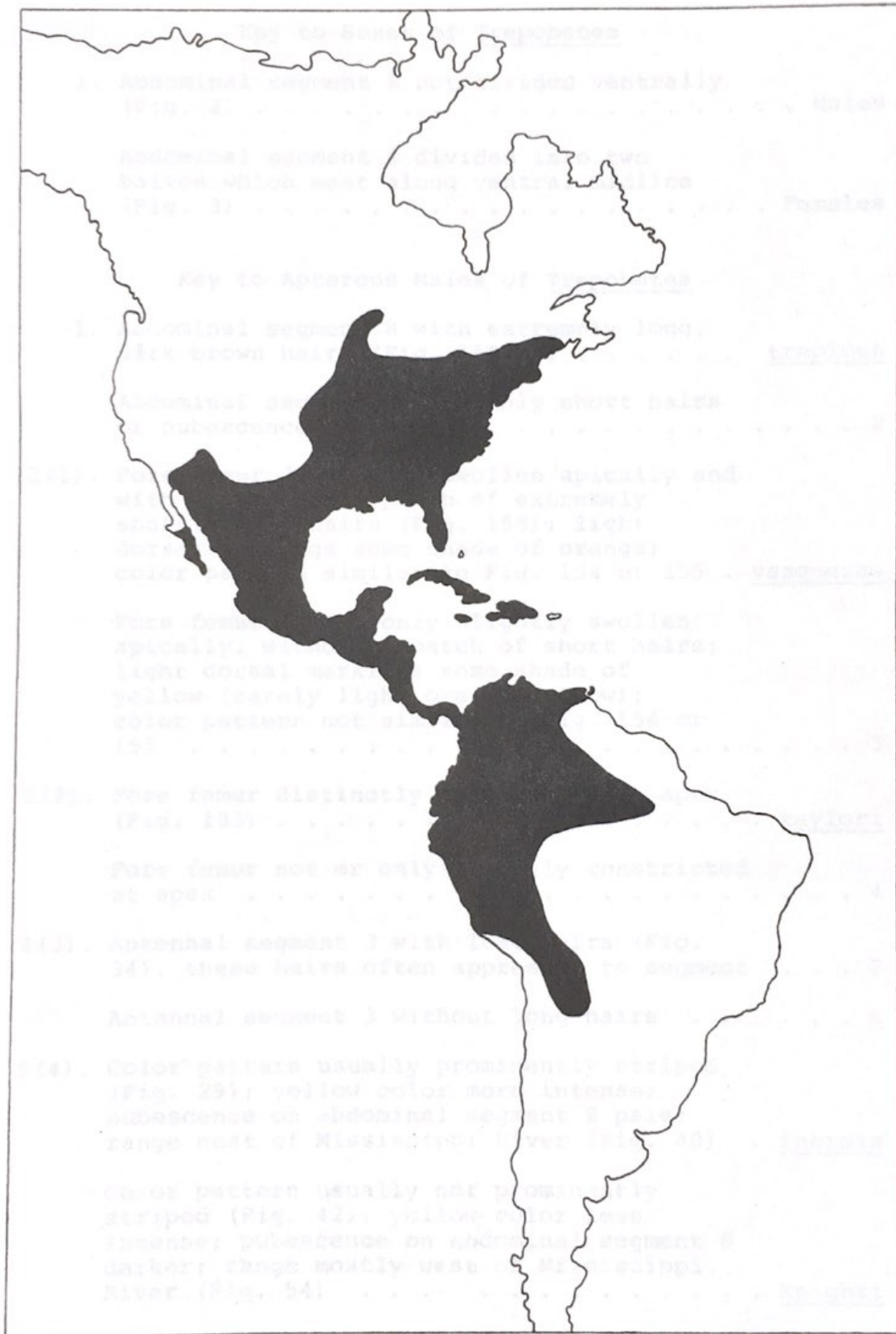


Fig. 1. Known distribution of the genus Trepobates.



Key to Sexes of Trepobates

1. Abdominal segment 8 not divided ventrally
(Fig. 2) Males

Abdominal segment 8 divided into two
halves which meet along ventral midline
(Fig. 3) Females

Key to Apterous Males of Trepobates

1. Abdominal segment 8 with extremely long,
dark brown hairs (Fig. 150) trepidus

Abdominal segment 8 with only short hairs
or pubescence 2

- 2(1). Fore femur distinctly swollen apically and
with a very thick patch of extremely
short, black hairs (Fig. 158); light
dorsal markings some shade of orange;
color pattern similar to Fig. 154 or 155 . vazquezae

Fore femur not or only slightly swollen
apically, without a patch of short hairs;
light dorsal markings some shade of
yellow (rarely light orange-yellow);
color pattern not similar to Fig. 154 or
155 3

- 3(2). Fore femur distinctly constricted at apex
(Fig. 133) taylori

Fore femur not or only slightly constricted
at apex 4

- 4(3). Antennal segment 3 with long hairs (Fig.
34), these hairs often appressed to segment 5

Antennal segment 3 without long hairs 6

- 5(4). Color pattern usually prominently striped
(Fig. 29); yellow color more intense;
pubescence on abdominal segment 8 pale;
range east of Mississippi River (Fig. 40) . inermis

Color pattern usually not prominently
striped (Fig. 42); yellow color less
intense; pubescence on abdominal segment 8
darker; range mostly west of Mississippi
River (Fig. 54) knighti

- 6(4). Usually with a light yellow mesopleural stripe posterior to black postocular stripe of pronotum which is continuous between anterior and posterior margins (Figs. 68 and 94), absent in extremely light individuals 7
- Without a light yellow mesopleural stripe posterior to black postocular stripe of pronotum which is continuous between anterior and posterior margins 8
- 7(6). Total length/antennal segment 1 ratio 3.46-4.33 (3.80); color pattern similar to Figs. 67-69; paramere as in Fig. 79; southern Texas southward (Fig. 80) n. sp. 2
- Total length/antennal segment 1 ratio 2.54-3.27 (3.04); color pattern similar to Figs. 93-95; paramere as in Fig. 109; eastern one-half of United States and southern Canada to eastern Texas (Fig. 110) pictus
- 8(6). Size small, 2.55-2.73 mm long, 1.04-1.13 mm wide; dark in color, with markings similar to Fig. 17 or 18 floridensis
- Size larger, 3.09-4.11 mm long, 1.18-1.64 mm wide; color and markings variable 9
- 9(8). Dorsal color pattern similar to Figs. 111-113; eastern one-half of United States and southern Canada to southern Texas and eastern New Mexico (Fig. 126) subnitidus
- Dorsal color pattern similar to Figs. 4-6, 55-56, or 81-82; Arizona and California southward (Figs. 16, 66, and 92) 10
- 10(9). Antennal segment 2 distinctly shorter than 3; hairs on middle tibia, at maximum length, 85-125% of diameter of tibia; anterior femur slightly swollen at apex; color pattern similar to Fig. 55 or 56 . . n. sp. 1
- Antennal segment 2 subequal to 3; hairs on middle tibia, at maximum length, 30-50% of diameter of tibia; anterior femur not swollen at apex; color pattern similar to Figs. 4-6, 81, or 82 11

- 11(10). Middle tibia 3.19-3.94 mm (3.59); hairs on middle femur, at maximum length, 60-80% of diameter of femur; paramere not greatly enlarged (Fig. 15); without a mesopleural spot posterior to black postocular stripe of pronotum becki

Middle tibia 2.46-3.06 mm (2.83); hairs on middle femur, at maximum length, 30-50% of diameter of femur; paramere greatly enlarged (Fig. 91); often with a small mesopleural spot posterior to black postocular stripe of pronotum (Fig. 82) panamensis

- 11(11). With a row of long hairs along posterior margin of ventrite 7 (Fig. 10, 87, or 147)

Without a row of long hairs along posterior margin of ventrite 7

- 11(12). Color pattern similar to Figs. 143-145 trapidus

Color pattern similar to Figs. 7, 8, or 83

- 11(13). Middle femur 1.53-2.19 mm (2.03); hairs along posterior margin of ventrite 7 distinctly interrupted at middle (Fig. 10); covering with short connexival spines (Fig. 11); larger species (3.71-4.26 mm long) with long legs; distribution as in Fig. 16 becki

Middle femur 1.52-1.78 mm (1.64); hairs along posterior margin of ventrite 7 not distinctly interrupted at middle (Fig. 87); without connexival spines; small species (3.11-3.86 mm long) with short legs; distribution as in Fig. 92 panamensis

- 11(14). With a fringe of long hairs along basal inner margin of hind femur (Fig. 91) and with a distinct patch of long hairs at end of mesonotal-mesopleural line (Fig. 86) n. sp. 1

Without a fringe of long hairs along basal inner margin of hind femur and with short hairs at end of mesonotal-mesopleural line or hairs absent

Key to Apterous Females of Trepobates

1. Mesonotum prolonged posteriorly (Figs. 73-74 or 99-103) 2
 - Mesonotum not prolonged posteriorly 3
- 2(1). Mesonotal projection short, blunt, very hairy (Fig. 73 or 74); southern Texas southward (Fig. 80) n. sp. 2
 - Mesonotal projection longer, usually sharply pointed, less hairy (Figs. 99-103); eastern one-half of United States and southern Canada to eastern Texas (Fig. 110) pictus
- 3(1). With a row of long hairs along posterior margin of ventrite 7 (Fig. 10, 87, or 147) 4
 - Without a row of long hairs along posterior margin of ventrite 7 6
- 4(3). Color pattern similar to Figs. 143-145 . . . trepidus
 - Color pattern similar to Figs. 7, 8, or 83-85 5
- 5(4). Middle femur 1.83-2.19 mm (2.03); hairs along posterior margin of ventrite 7 distinctly interrupted at middle (Fig. 10); usually with short connexival spines (Fig. 11); large species (3.71-4.26 mm long) with long legs; distribution as in Fig. 16 becki
 - Middle femur 1.52-1.78 mm (1.64); hairs along posterior margin of ventrite 7 not distinctly interrupted at middle (Fig. 87); without connexival spines; small species (3.11-3.86 mm long) with short legs; distribution as in Fig. 92 panamensis
- 6(3). With a fringe of long hairs along basal inner margin of hind femur (Fig. 61) and with a distinct patch of long hairs at end of mesonotal-mesopleural line (Fig. 60). . . n. sp. 1
 - Without a fringe of long hairs along basal inner margin of hind femur and with short hairs at end of mesonotal-mesopleural line or hairs absent 7

- 7(6). Light dorsal markings some shade of orange; without hairs along mesonotal-mesopleural line, lateral margins of connexiva, and on metanotum; color pattern similar to Fig. 156 or 157 vazquezae
- Light dorsal markings some shade of yellow; with hairs along mesonotal-mesopleural line, lateral margins of connexiva, or on metanotum; color pattern not similar to Fig. 156 or 157 8
- 8(7). With a mesopleural spot posterior to black postocular stripe of pronotum (Figs. 32 and 45); antennal segment 2 distinctly shorter than 3 9
- Only rarely with a mesopleural spot posterior to black postocular stripe of pronotum (if mesopleural spot is present, it is small as in Fig. 132); antennal segment 2 only slightly shorter than or subequal to 3 10
- 9(8). Usually with long or short connexival spines (Fig. 47 or 48); color pattern usually not prominently striped (Fig. 45); yellow color less intense; range mostly west of Mississippi River (Fig. 54) knighti
- Without connexival spines; color pattern usually prominently striped (Fig. 32); yellow color more intense; range east of Mississippi River (Fig. 40) inermis
- 10(8). Size small, 3.03-3.27 mm long; middle tibia 2.32-2.91 mm; color pattern similar to Figs. 19-21 floridensis
- Size larger, 3.42-4.03 mm long; middle tibia 3.16-4.16 mm; color pattern similar to Figs. 114-116 or 130-132 11
- 11(10). With a patch of very short dark hairs along posterior portion of mesonotal-mesopleural line; without paired brown spots on mesosternum; without long hairs along lateral edges of metanotum; eastern one-half of United States and southern Canada to southern Texas and eastern New Mexico (Fig. 126) subnitidus

Without a patch of very short dark hairs along posterior portion of mesonotal-mesopleural line; sometimes with paired brown spots on mesosternum (Fig. 134); sometimes with long hairs along lateral edges of metanotum; southern Texas southward (Fig. 139) taylori

Fig. 2. Ventral view of apex of male Tropobates. PA, paramere; PY, pygophore; AS8, abdominal segment 8; V7, ventrite 7; V2, ventrite 2; NS, metasternum.

Fig. 3. Ventral view of apex of female Tropobates. AS8, abdominal segment 8; V7, ventrite 7; V2, ventrite 2; NS, metasternum.

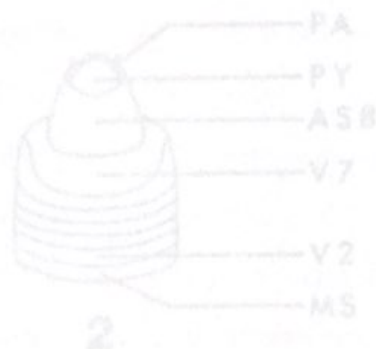
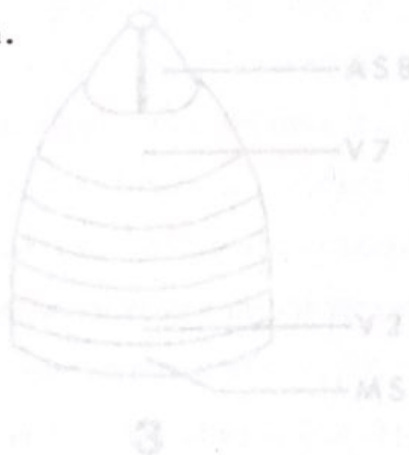


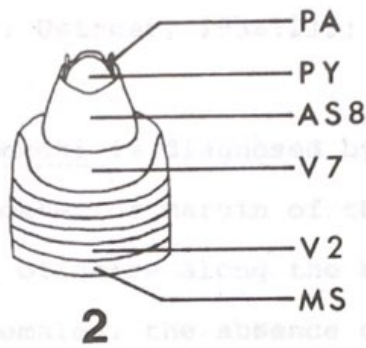
Fig. 2. Ventral view of apex of male Trepobates. PA, paramere; PY, pygophore; AS8, abdominal segment 8; V7, ventrite 7; V2, ventrite 2; MS, metasternum.

Fig. 3. Ventral view of apex of female Trepobates. AS8, abdominal segment 8; V7, ventrite 7; V2, ventrite 2; MS, metasternum.

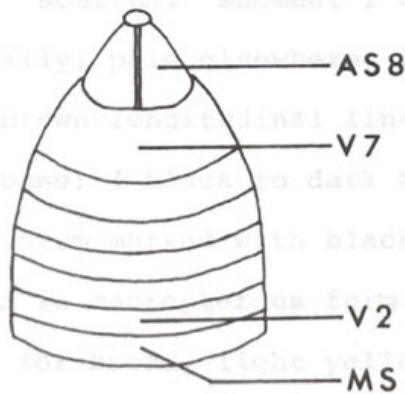


10 mm

Figs. 4-10



2



3

1.0 mm

Trepobates becki Drake and Harris, 1932b:120; Drake and Harris, 1938:75; Drake and Hottes, 1952:38; Drake and Chapman, 1953:112; Usinger, 1956:215; Polhemus, 1972:148.

Diagnosis.— T. becki is diagnosed by the presence of long hairs along the posterior margin of the seventh ventrite in females, the fringe of hairs along the basal inner margin of the hind femur in females, the absence of long hairs on the eighth abdominal segment of males, and the shape of the male paramere.

Description.— HEAD: Marked with black and light yellow (Figs. 4-8). Antennae: segment 1 slightly bowed at base, dark brown apically, pale yellow basally, the extent of yellow color variable; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 very light in color, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 4-8). Pronotum in macropterous form prolonged posteriorly, black except for broad, light yellow longitudinal stripes which continue around posterior margin and sometimes an anterior median stripe. Prosternum pale yellow. Anterior femur strongly bowed just beyond middle in males, very slightly bowed near base in females; mostly light yellow,

with dark brown markings dorsally and laterally, a pale yellow ring at apex; very slightly constricted at apex in males. Tibia slightly bowed in males, straight in females; mostly dark brown, with some pale yellow markings. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 4-8), not prolonged posteriorly in females; a patch of short, dark hairs along anterior portion of mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum absent. Mesosternum pale yellow, black color of mesopleuron sometimes extending onto anterior margin. Middle femur patterned with dark brown and light yellow, males with a thick ventral fringe of long, dark brown hairs; these hairs, at maximum length, approximately 60-80% of the diameter of the femur. Tibia dark brown; males with a single ventral row of short hairs along basal one-fourth which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 50% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum with black and light yellow markings, usually with a median patch of long, dark brown hairs in females. Metasternum pale yellow. Posterior femur mostly dark brown but with a light yellow stripe dorsally; with a dense fringe of long hairs along basal inner margin in females (Fig. 9). Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black, some marked with light yellow, especially in females; posterior tergites covered with a gray-blue bloom. Ventrites mostly pale yellow but black along sides and anterior margins in some individuals; ventrite 7 in females with a row of long, dark brown hairs along posterior margin, this row distinctly interrupted at middle (Fig. 10). Connexival segments mostly light yellow with black anterior margins; lateral margins of segments 5 and 6 in males with moderately long, dark hairs; segments 3-7 in females with long, dark hairs; connexiva in females usually produced at apex into short, hairy spines (Fig. 11), these spines sometimes reduced or absent.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 12; with short, thin, mostly pale pubescence ventrally (Fig. 13). Pygophore with brown pubescence, long at middle and short posteriorly. Dorsal shaft of endosoma shown in Fig. 14. Paramere large, sharply pointed at apex (Fig. 15).

Measurements.— **HEAD:** Transocular width of male 1.02-1.09 mm (1.05), female 1.00-1.12 mm (1.06). Interocular space of male 0.38-0.43 mm (0.41), female 0.40-0.45 mm (0.42). **Antennae:** male— 1) 0.86-0.96 mm (0.90), 2) 0.46-0.56 mm (0.51), 3) 0.46-0.58 mm (0.53), 4) 0.56-0.66 mm (0.61); female— 1) 0.73-0.94 mm (0.82), 2) 0.44-0.53 mm (0.48), 3) 0.52-0.63 mm (0.55), 4) 0.56-0.66 mm (0.61).

PROTHORAX: Pronotum: male— 0.91-0.99 mm (0.96) wide, 0.48-0.56 mm (0.52) long; female— 0.83-0.98 mm (0.90) wide,

0.40-0.45 mm (0.43) long. Anterior femur in male 1.39-1.52 mm (1.47), female 1.22-1.37 mm (1.31). Tibia in male 1.01-1.11 mm (1.07), female 0.96-1.02 mm (0.99). Tarsus 1 in male 0.07-0.10 mm (0.09), female 0.07-0.11 mm (0.08). Tarsus 2 in male 0.40-0.48 mm (0.43), female 0.38-0.49 mm (0.44).

MESOTHORAX: Mesonotum: male— 1.44-1.64 mm (1.51) wide, 0.94-1.04 mm (0.99) long; female— 1.75-2.12 mm (1.94) wide, 1.06-1.16 mm (1.10) long. Middle femur in male 1.67-2.04 mm (1.89), female 1.83-2.19 mm (2.03). Tibia in male 3.19-3.94 mm (3.59), female 3.34-4.26 mm (3.83). Tarsus 1 in male 0.96-1.26 mm (1.10), female 1.15-1.42 mm (1.26). Tarsus 2 in male 0.84-1.07 mm (0.97), female 0.93-1.21 mm (1.07).

METATHORAX: Posterior femur in male 2.37-2.86 mm (2.63), female 2.36-3.06 mm (2.73). Tibia in male 1.22-1.59 mm (1.43), female 1.22-1.65 mm (1.50). Tarsus 1 in male 0.45-0.66 mm (0.56), female 0.50-0.69 mm (0.60). Tarsus 2 in male 0.31-0.39 mm (0.35), female 0.31-0.51 mm (0.39).

SIZE: Length— male 3.56-3.86 mm (3.75), female 3.71-4.26 mm (3.95). Width— male 1.44-1.64 mm (1.51), female 1.75-2.12 mm (1.94).

Type Data.— The male holotype, female allotype, and single male and female paratypes are in the Drake Collection, U.S. National Museum, and were examined. These specimens were collected by D. E. Beck on July 23, 1931, from a stream at Colonia Juarez, Chihuahua, Mexico.

Taxonomy.— T. becki has not been confused with other species of Trepobates in the past and can be identified by the characters presented in the description and keys. Its similarity to T. panamensis is discussed under that species (see page 103).

Intraspecific Variation.— T. becki is somewhat variable in the amount of dark pigment present (Figs. 4-8). Females of this species nearly always have a median patch of metanotal hairs. The connexiva in females usually are produced into short spines (Fig. 11), but these spines are sometimes reduced or absent. T. becki exhibits wing dimorphism, but the large majority (87%) of specimens examined were apterous.

Natural History.— This species apparently is fairly common and has been collected from both lotic and lentic habitats. Collection records exist for each month of the year, but the majority of these are from June through October. No life history studies have been conducted for T. becki.

Distribution.— T. becki is known from Arizona and California in the United States and southward into several states of Mexico (Fig. 16). The record of this species from New Mexico (Drake and Chapman, 1953) could not be confirmed. The records of T. pictus from Utah (Moore and Hungerford, 1922) probably apply to T. becki. New state distribution records are listed below for the Mexican states of Aguascalientes, Durango, Jalisco, Mexico, Michoacan, Morelos, Nayarit, Oaxaca, Puebla, San Luis Potosi, Sinaloa, and Sonora.

Material Examined.— MEXICO: Aguascalientes: Aguascalientes, Aug. 5, 1950, 1f (USNM), 1f (HCC). Chihuahua: San Luis Babarocos, Dec. 30, 1934, 1m (UKL); Colonia Juarez, July 23, 1931, 1m (holotype), 1f (allotype), 1m, 1f (paratypes) (USNM). Durango: hot spring, 5 mi. E of Durango, Aug. 3, 1952, 1m, 9f (JTP); Rio Santiago, 11 mi. E of Durango, July 9, 1952, 5m, 5f (JTP); Penon Blanco, Aug. 1, 1952, 1m, 3f (JTP); hot spring, Las Conchas, Aug. 1, 1952, 3m, 6f (JTP); Durango, July 12, 1951, 3m, 1f (USNM), Aug. 6, 1950, 1m (JTP), 2f (USNM). Jalisco: Chapala, Sept. 11, 1938, 2m, 1f (UKL); 10 mi. N of Chapala, April 22, 1964, 4m (JTP); La Quemada, Aug. 26, 1959, 1f (USNM); 62 mi. W of Guadalajara, Sept. 11, 1972, 1m (USU); 13 mi. N of Guadalajara, Sept. 2, 1971, 3m, 2f (USU); 24 mi. S of Puerto Vallarta, Aug. 23, 1976, 1m, 1f (USU); Guadalajara, Aug. 4, 1950, 2m, 2f (USNM), Sept. 10, 1938, 1m, 4f (UKL). Mexico: Tejupilco, June 16, 1933, 2m (UCB); Real de Arriba, July 7, 1933, 1m (UCB). Morelos: Tepoztlan, Aug. 1, 1938, 2f (UKL). Michoacan: Patzcuaro, July 17, 1951, 2m (USNM). Nayarit: 16 mi. S of Tepic, Sept. 24, 1953, 2m, 2f (JTP); 23 mi. SE of Tepic, Aug. 26, 1959, 1m, 2f (USNM); large spring, San Blas, June 3, 1966, 1m (JTP); Jesus Maria, July 6, 1955, 1f (JTP). Oaxaca: 9 mi. SW of Oaxaca, July 6, 1953, 3m, 3f (UKL); Oaxaca, July 21, 1931, 1f (USNM). Puebla: Puebla, July 30, 1950, 1m (USNM); 20 mi. SE of Acatlan, April 28, 1964, 1f (JTP); Teziutlan, July 27, 1950, 1m (USNM). San Luis Potosi: stream, 14 mi. E of Ciudad del Maiz, Jan. 9, 1971, 1m (JTP);

Agua del Medio, vic. Charcas, July 20-21, 1934, 1m (UMAA);
 Santa Maria del Rio, Dec. 9, 1973, 2f (JTP). Sinaloa:
 Santa Lucia, April 20, 1964, 1m (JTP). Sonora: Arroyo
 Huerta, near La Huerta, June 24, 1971, 1f (RET); Arroyo
 Tarum, Feb. 15, 1973, 1m, 1f, March 22, 1973, 2m, 2f, May 3,
 1973, 13m, 9f, May 10, 1973, 3m, 1f, Nov. 15, 1973, 1m (RET);
 Arroyo de los Platanos, near Guirocoba, Feb. 12, 1973, 2m,
 Feb. 14, 1973, 1f, Feb. 16, 1973, 1f, Feb. 19, 1973, 1m,
 March 28, 1973, 1m, 2f, April 5-6, 1973, 4m, 4f, Dec. 21,
 1970, 3m, 2f (RET); small river, 9 mi. E of Sabino, June 5,
 1975, 1f (JTP); Arroyo Cuchujaqui, 8 mi. NW of Guirocoba,
 April 13, 1973, 1m, 2f (RET); Rio Guirocoba, March 31, 1973,
 1f (RET); Guaymas, April, 1957, 1m (LACM), May 28-June 5,
 1966, 3m (JTP); Alamos, July 30, 1933, 1f (CAS), Aug. 26,
 1959, 1m (LACM); Arroyo S. Marcial, Alamos, Oct. 28, 1934,
 1m (UKL); stream, S of Nacazori, June 3, 1975, 2m (JTP);
 Cajon Bonito, 38 mi. E of Agua Prieta, May 1, 1974, 1f (JTP);
 spring, Rancho los Barrios near Presa Amargosa, June 3, 1975,
 5m, 3f (JTP).

UNITED STATES: Arizona: Cochise Co.: Huachuca Mts.,
 Aug., 1934, 1m, 1f (USNM); San Bernardino Ranch, April 1,
 1958, 1m, 1f (LACM). Gila Co.: East Verde R., 7 mi. N of
 Payson, Sept. 11, 1958, 9f (LACM). Maricopa Co.: Phoenix,
 Jan. 1, 1905, 1m, 1f, Dec. 4, 1904, 1m, 1f (UKL); Salt R.,
 Phoenix, Sept. 11, 1926, 1m, 2f (UMAA), Oct. 15, 1922, 2m,
 8f (UMSP). Pima Co.: Mt. Lemmon, Aug. 21, 1937, 9m, 13f
 (USNM), 1m, 1f (JTP), 1f (FMNH), 1m (MSU), 1m (UCS); Sabino

Canyon, April, 1m, 3f (CAS), July 12, 1932, 10m, 9f (UKL), July 19, 1938, 12m, 17f (UKL), July 21, 1965, 1f (CAS), Sept. 10, 1958, 9m, 15f (LACM), Sept. 24, 1928, 1f (CAS), Oct. 7, 1934, 5m, 14f (UKL); Santa Catalina Mts., Oct. 1, 1938, 1f (LACM), 1m, 2f (CAS); Bear Canyon, Nov. 25, 1934, 2m, 1f (UKL); Aguas Caltes Ranch, Tucson, Nov. 14, 1936, 1f (UKL). Pinal Co.: La Barge Canyon, 2 mi. NNE of Weaver's Needle, Sept. 23, 1973, 3m, 1f (ASU); Superior, Oct. 7, 1964, 1m (JTP). Santa Cruz Co.: Pena Blanca L., 11 mi. WNW of Nogales, June 8, 1976, 1m (PDK); Sycamore Canyon Cr., 15 mi. WNW of Nogales, June 8, 1976, 8m, 15f (PDK). Yavapai Co.: Oak Cr., near Cornville, June 17, 1976, 1m, 1f (MWS); pond, near Clarkdale, Aug. 16, 1976, 8m, 7f (MWS); Castle Hot Springs, Aug. 5, 1941, 4m, 5f (UKL), Oct. 7, 1964, 16m, 19f (JTP); Camp Verde, Sept. 2, 1932, 2m, 1f (ISU), 5m, 2f (LSU), Sept. 2, 1938, 1f (UMAA), Oct. 7, 1964, 34m, 38f (JTP), 2m, 1f (BMNH), 2m, 4f (CSU), 2m, 2f (OU), 2m, 2f (AMNH), 2m, 3f (UKL), Oct. 15, 1966, 1m, 1f (NAU). Yuma Co.: vic. Imperial Dam, Sept. 4-5, 1966, 2f (UCR). County unknown: Gila R., Aug. 20, 1934, 2m (USNM). California: Imperial Co.: Laguna Lake Dam, Oct. 15, 1954, 13m, 26f (LACM), 2m, 2f (JTP), 2m, 2f (HCC); near Laguna Dam, Sept. 14, 1951, 1f (UCB); L. Houghtelin, near Bard, Nov. 13, 1951, 7m, 12f (UCB), 1m (HCC).



Fig. 4. Color pattern of male T. becki, Sonora, Mexico.

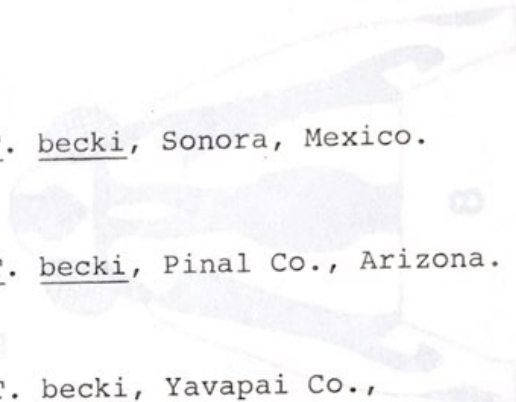


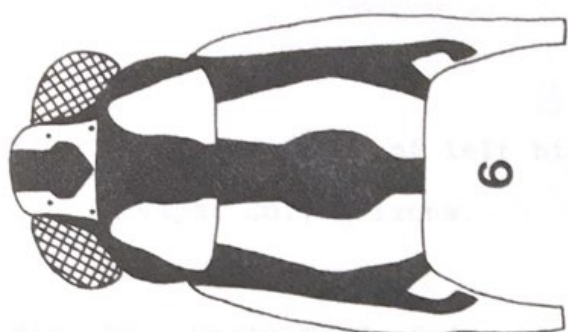
Fig. 5. Color pattern of male T. becki, Pinal Co., Arizona.

Fig. 6. Color pattern of male T. becki, Yavapai Co.,
Arizona.

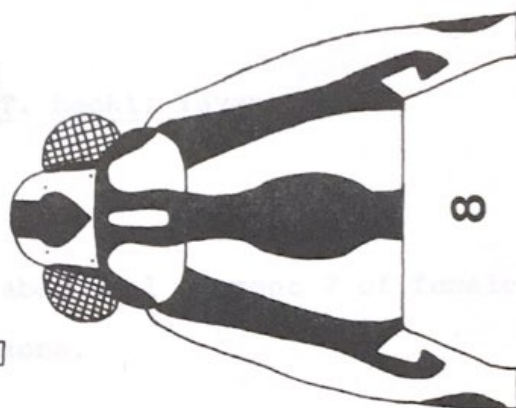
Fig. 7. Color pattern of female T. becki, Imperial Co.,
California.

Fig. 8. Color pattern of female T. becki, Yavapai Co.,
Arizona.

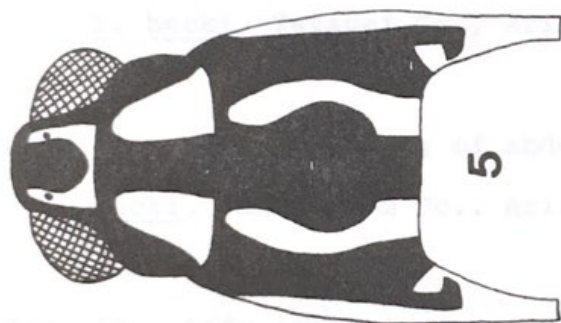




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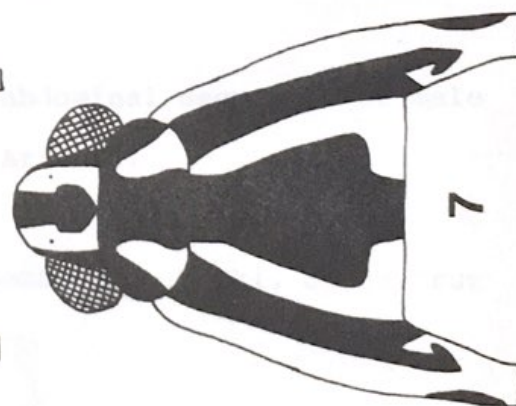


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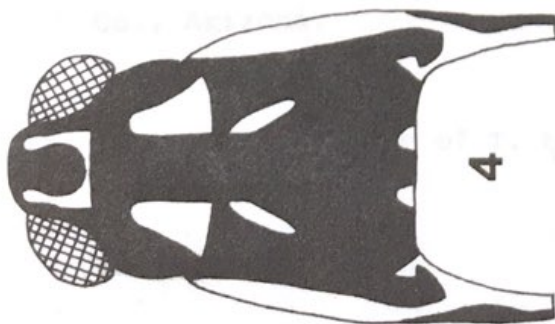


5

0.5 mm



7



4



9

Fig. 9. Dorsal view of left hind femur of female T. becki,
Yavapai Co., Arizona. 0.5mm

Fig. 10. Ventricle 7 of female T. becki, Yavapai Co.,
Arizona.

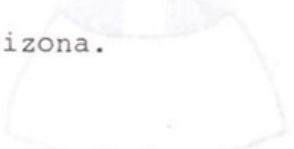


Fig. 11. Left lateral view of abdominal segment 7 of female
T. becki, Yavapai Co., Arizona.

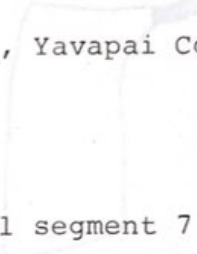


Fig. 12. Dorsal profile of abdominal segment 8 of male T.
becki, Santa Cruz Co., Arizona.

Fig. 13. Left lateral view of abdominal segment 8 of male
T. becki, Santa Cruz Co., Arizona.

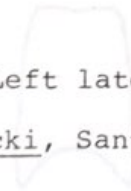


Fig. 14. Dorsal shaft of endosoma of T. becki, Santa Cruz
Co., Arizona.

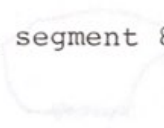


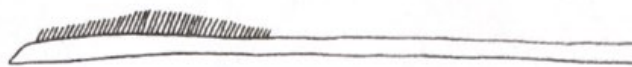
Fig. 15. Left paramere of T. becki, Santa Cruz Co., Arizona.



14

0.5mm

15



9

0.5 mm

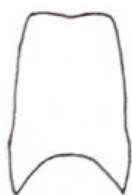


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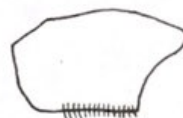
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Fig. 16. Distribution of *T. becki*.



12

0.5 mm



13



14

0.1 mm



15

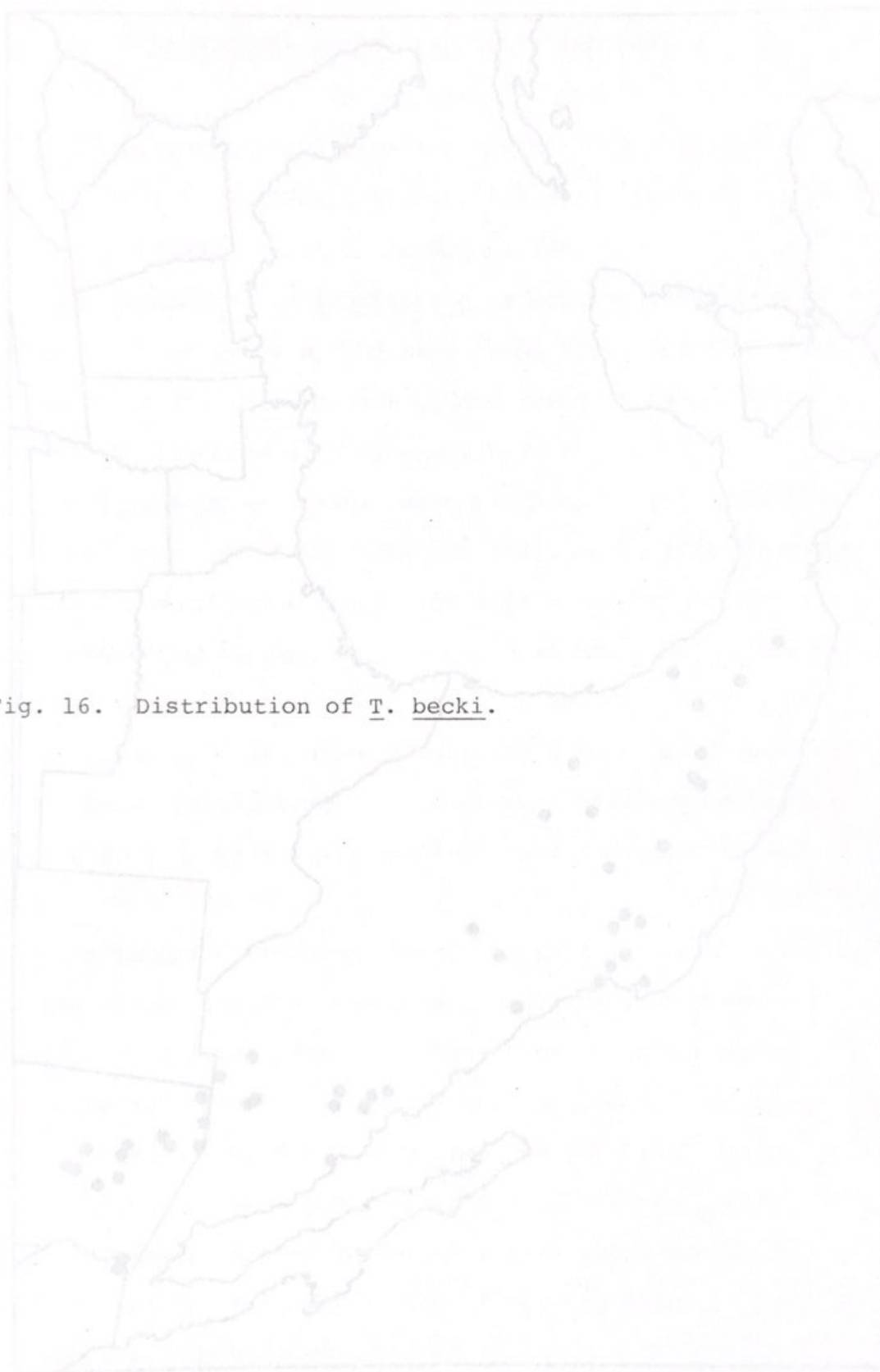
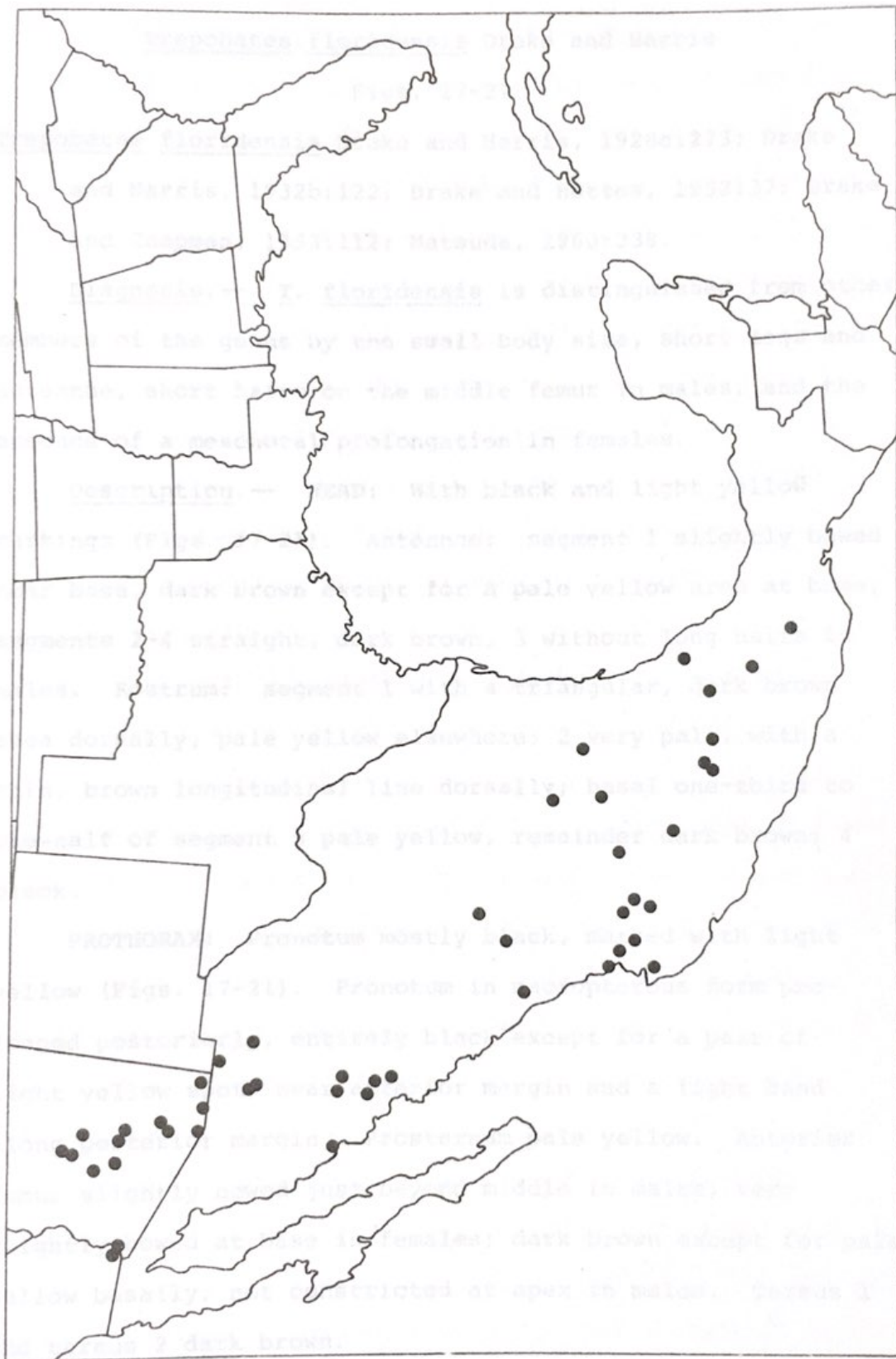


Fig. 16. Distribution of *T. becki*.



Trepobates floridensis Drake and Harris

Figs. 17-27

Trepobates floridensis Drake and Harris, 1928c:273; Drake and Harris, 1932b:122; Drake and Hottes, 1952:37; Drake and Chapman, 1953:112; Matsuda, 1960:338.

Diagnosis.— T. floridensis is distinguished from other members of the genus by the small body size, short legs and antennae, short hairs on the middle femur in males, and the absence of a mesonotal prolongation in females.

Description.— HEAD: With black and light yellow markings (Figs. 17-21). Antennae: segment 1 slightly bowed near base, dark brown except for a pale yellow area at base; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale yellow elsewhere; 2 very pale, with a thin, brown longitudinal line dorsally; basal one-third to one-half of segment 3 pale yellow, remainder dark brown; 4 black.

PROTHORAX: Pronotum mostly black, marked with light yellow (Figs. 17-21). Pronotum in macropterous form prolonged posteriorly, entirely black except for a pair of light yellow spots near anterior margin and a light band along posterior margin. Prosternum pale yellow. Anterior femur slightly bowed just beyond middle in males, very slightly bowed at base in females; dark brown except for pale yellow basally; not constricted at apex in males. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum mostly black, marked with light yellow (Figs. 17-21), not prolonged posteriorly in females; a very small patch of short, dark hairs sometimes present along posterior portion of mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum absent. Black color of mesopleuron extending onto anterior margin of mesosternum, remainder of mesosternum light yellow. Middle femur brown, lighter ventrally; males with a thick ventral fringe of short, dark brown hairs (Fig. 22); these hairs, at maximum length, approximately 45-55% of the diameter of the femur. Tibia brown to dark brown; in males with a single ventral row of short hairs along basal one-third which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 40-45% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum with a pair of light yellow spots along posterior margin, sometimes entirely black; without a median patch of hairs in females. Metasternum pale yellow. Posterior femur dark brown to brown, without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black with some gray-blue bloom; tergites 1-2 and 6-7 sometimes with paired, light yellow spots. Ventrites mostly pale yellow in females, with some black laterally; black laterally and along anterior margins, pale yellow medially in males; ventrite 7 in females without long hairs posteriorly. Connexival segments mostly

black to dark brown, sometimes with small central, light yellow spots; lateral margins of segments 5 and 6 in males with moderately long, dark hairs; segments 3-6 in females with moderately long, dark hairs; connexiva not produced into spines at apex in females.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 23; with short, thin, pale pubescence ventrally (Fig. 24). Pygophore covered with short pubescence at middle and posteriorly. Dorsal shaft of endosoma shown in Fig. 25. Paramere as in Fig. 26.

Measurements.— HEAD: Transocular width of male 0.78-0.84 mm (0.81), female 0.83-0.89 mm (0.86). Interocular space of male 0.28-0.31 mm (0.30), female 0.32-0.36 (0.34). Antennae: male— 1) 0.69-0.86 mm (0.81), 2) 0.33-0.43 mm (0.40), 3) 0.35-0.49 mm (0.43), 4) 0.46-0.51 mm (0.49); female— 1) 0.66-0.73 mm (0.69), 2) 0.36-0.43 mm (0.40), 3) 0.40-0.51 mm (0.45), 4) 0.48-0.56 mm (0.51).

PROTHORAX: Pronotum: male— 0.64-0.73 mm (0.69) wide, 0.32-0.36 mm (0.34) long; female— 0.70-0.77 mm (0.74) wide, 0.31-0.36 mm (0.33) long. Anterior femur in male 1.11-1.22 mm (1.15), female 0.96-1.12 mm (1.02). Tibia in male 0.73-0.79 mm (0.75), female 0.68-0.79 mm (0.72). Tarsus 1 in male 0.05-0.07 mm (0.06), female 0.07-0.10 mm (0.08). Tarsus 2 in male 0.26-0.33 mm (0.30), female 0.30-0.38 mm (0.33).

MESOTHORAX: Mesonotum: male— 1.04-1.13 mm (1.09) wide, 0.67-0.76 mm (0.74) long; female— 1.42-1.62 mm (1.51) wide, 0.79-0.93 mm (0.90) long. Middle femur in male 1.22-

1.42 mm (1.34), female 1.37-1.69 mm (1.50). Tibia in male 2.17-2.57 mm (2.35), female 2.32-2.91 mm (2.66). Tarsus 1 in male 0.70-0.84 mm (0.77), female 0.79-1.12 mm (0.92). Tarsus 2 in male 0.60-0.69 mm (0.62), female 0.73-0.82 mm (0.76).

METATHORAX: Posterior femur in male 1.56-1.92 mm (1.77), female 1.73-2.22 mm (1.91). Tibia in male 0.79-0.94 mm (0.84), female 0.85-1.10 mm (0.97). Tarsus 1 in male 0.30-0.38 mm (0.33), female 0.34-0.46 mm (0.40). Tarsus 2 in male 0.22-0.26 mm (0.25), female 0.26-0.30 mm (0.28).

SIZE: Length— male 2.55-2.73 mm (2.62), female 3.03-3.27 mm (3.12). Width— male 1.04-1.13 mm (1.09), female 1.42-1.62 mm (1.51).

Type Data.— The male holotype from eastern Florida, collected by H. E. Summers, and the female allotype from Jacksonville, Florida, are in the Drake Collection, U.S. National Museum, and were examined during this investigation.

Taxonomy.— T. floridensis has not been frequently confused with other species of Trepobates in the literature, but Berner and Sloan (1954) misidentified T. subnitidus as T. floridensis. This species can be identified by the characters presented in the description and keys.

Intraspecific Variation.— While most specimens examined were very dark in color, the amount of dark pigment present varied considerably (Figs. 17-21). Females sometimes have a patch of short hairs along the posterior portion of

the mesonotal-mesopleural line, but these hairs were absent in most specimens examined. Only 4% of the specimens examined were macropterous, and this represents the first report of this form.

Natural History.— T. floridensis is not an abundant species but may be locally common. It has been collected from a variety of habitats, including ponds, swamps, lakes, streams, a roadside ditch, and a pasture pool. I collected this species in association with Rheumatobates palosi in the Okefenokee Swamp, Georgia. T. floridensis has been collected each month from March through October and in December. Life history studies have not been done on T. floridensis.

Distribution.— This water strider is known only from the southeastern United States (Fig. 27) and was previously known only from eastern Florida. New state records are given below for Alabama, Georgia, and Mississippi.

Material Examined.— UNITED STATES: Alabama: Houston Co.: Chattahoochee St. Pk., Sept. 12, 1954, 2m, 8f (FSCA). Florida: Alachua Co.: Waldo, Aug. 18, 1930, 1f (UKL); Gainesville, July 13, 1955, 1m (FSCA). Baker Co.: stream, 10 mi. W of Baxter, Aug. 12, 1975, 2m, 4f (PDK). Clay Co.: vic. Melrose, May 16, 1954, 1f (UMAA). Collier Co.: 9 mi. E of Naples, Oct. 29, 1949, 1f (FSCA). Dade Co.: Paurotis Pond, Everglades Nat. Pk., March 8, 1974, 1f (UG); Royal Palm, Everglades Nat. Pk., Dec. 7, 1937, 1f (PU). Duval Co.: Jacksonville, 1f (allotype) (USNM). Hillsborough Co.: Plant City, Aug. 15, 1930, 2f (UKL). Jackson Co.: pasture

pool, June 7, 1953, 2f (UMAA). Lake Co.: Groveland, Sept. 5, 1937, 5m, 9f (FSCA). Marion Co.: Ocala, Aug. 17, 1930, 1m, 1f (JTP), 1m, 1f (UKL). Orange Co.: Sylvan L., Aug. 19, 1952, 1m, 2f (USNM); L. Jessamine, Aug. 16, 1952, 9m, 10f (USNM); Winter Park, May 10, 1952, 2m (USNM); Pine Castle, April 28, 1952, 3m, 3f (HCC), 2f (USNM), Aug. 8, 1952, 5m, 2f (USNM). Santa Rosa Co.: lake, 4.5 mi. NW of Holt, June 14, 1974, 4f (UG). Sarasota Co.: Fruitville, Aug. 11, 1930, 1f (UKL). Seminole Co.: Oviedo, Dec. 5, 1951, 1f (HCC). Volusia Co.: Osteen, Aug. 6, 1952, 6m, 4f (USNM). County unknown: E. Florida, 1m (holotype) (USNM). Georgia: Baker Co.: pond, 9.4 mi. W of Damascus, Aug. 22, 1975, 1f (UG); pond, Elmodel, Aug. 22, 1975, 4m, 4f (UG). Charlton Co.: Okefenokee Swamp, 14 mi. NE of Fargo, Aug. 11, 1975, 8m, 1f (PDK); Okefenokee Swamp, 19 mi. W of Folkston, Aug. 13, 1975, 1m, 5f (PDK); Okefenokee Swamp, 17 mi. NE of Fargo, Aug. 13, 1975, 7m, 6f (PDK); stream, 12 mi. N of St. George, Aug. 12, 1975, 2m, 1f (PDK); stream, 2 mi. SW of Folkston, Aug. 12, 1975, 1f (PDK); roadside ditch, 2 mi. E of St. George, Aug. 12, 1975, 3m, 7f (PDK). Colquitt Co.: pond, 9.7 mi. W of Reed Bingham St. Pk., May 24, 1975, 3m, 6f (UG). Thomas Co.: Thomasville, Aug. 15, 1927, 2m, 1f (JTP), 3m, 5f (UKL). Ware Co.: Laura Walker St. Pk., Sept. 6, 1973, 1m, 1f (UG); Okefenokee Swamp, 22 mi. SE of Homerville, Aug. 14, 1975, 3m, 1f (PDK); County unknown: Okefenokee Swamp, July 30, 1934, 2f (UKL). Mississippi: Jackson Co.: Biloxi, Oct. 11, 1949, 1f (UCS).




Fig. 17. Color pattern of male T. floridensis, Charlton Co., Georgia.

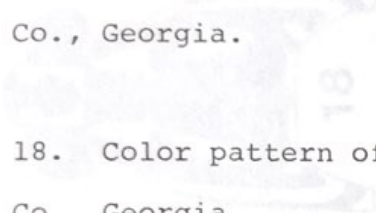


Fig. 18. Color pattern of male T. floridensis, Colquitt Co., Georgia.

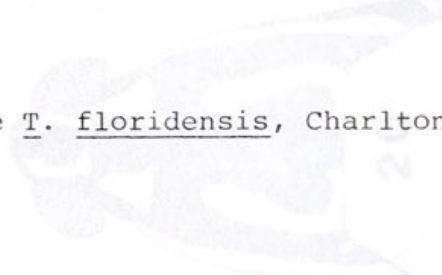


Fig. 19. Color pattern of female T. floridensis, Charlton Co., Georgia.

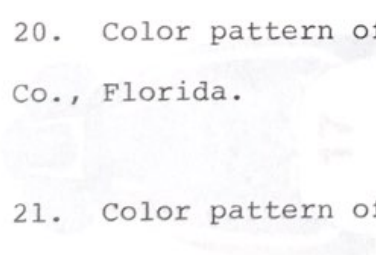


Fig. 20. Color pattern of female T. floridensis, Santa Rosa Co., Florida.


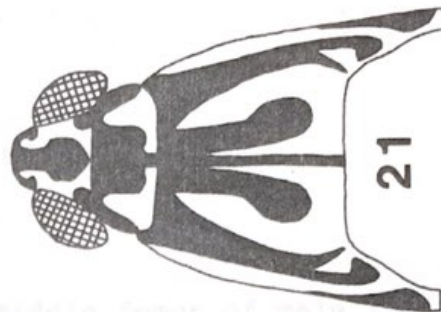
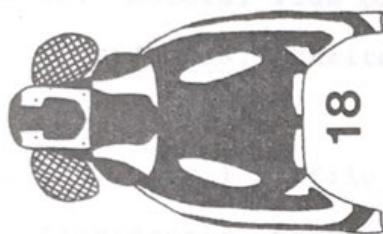


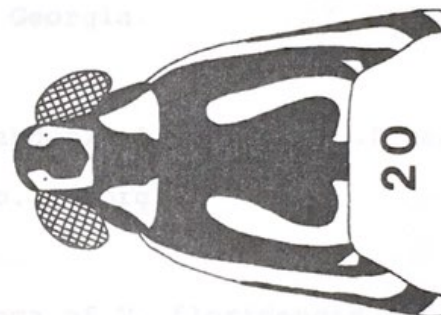
Fig. 21. Color pattern of female T. floridensis, Dade Co., Florida.



21

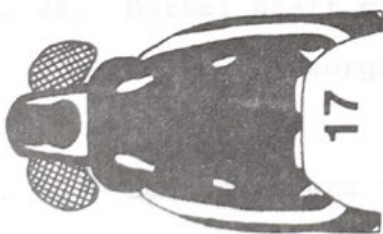


18

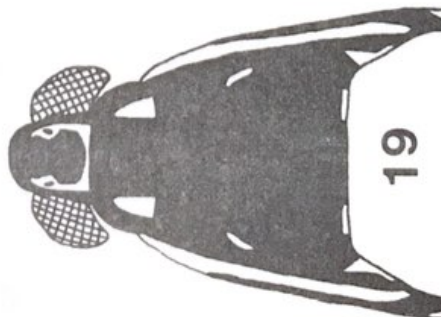


20

0.5 mm



17



19



22

Fig. 22. Lateral view of left middle femur of male T. floridensis, Charlton Co., Georgia.

Fig. 23. Dorsal profile of abdominal segment 8 of male T. floridensis, Charlton Co., Georgia.

Fig. 24. Left lateral view of abdominal segment 8 of male T. floridensis, Charlton Co., Georgia.

23

0.5 mm

24

Fig. 25. Dorsal shaft of endosoma of T. floridensis, Charlton Co., Georgia.

Fig. 26. Left paramere of T. floridensis, Charlton Co., Georgia.



25



26

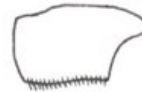
0.1 mm



22



23



24

0.5 mm



25



26

0.1 mm

Fig. 27. Distribution of *T. floridensis*.

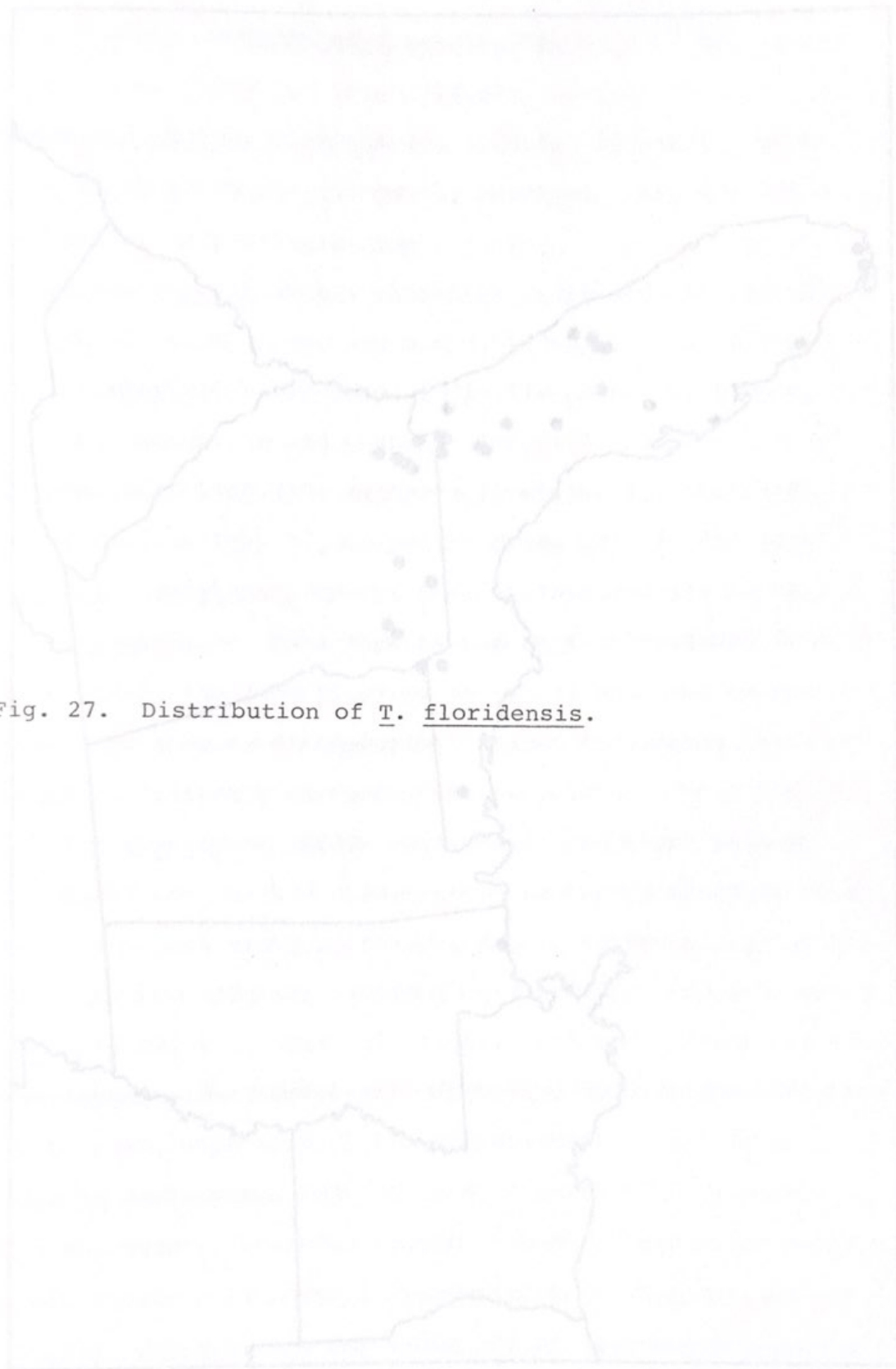
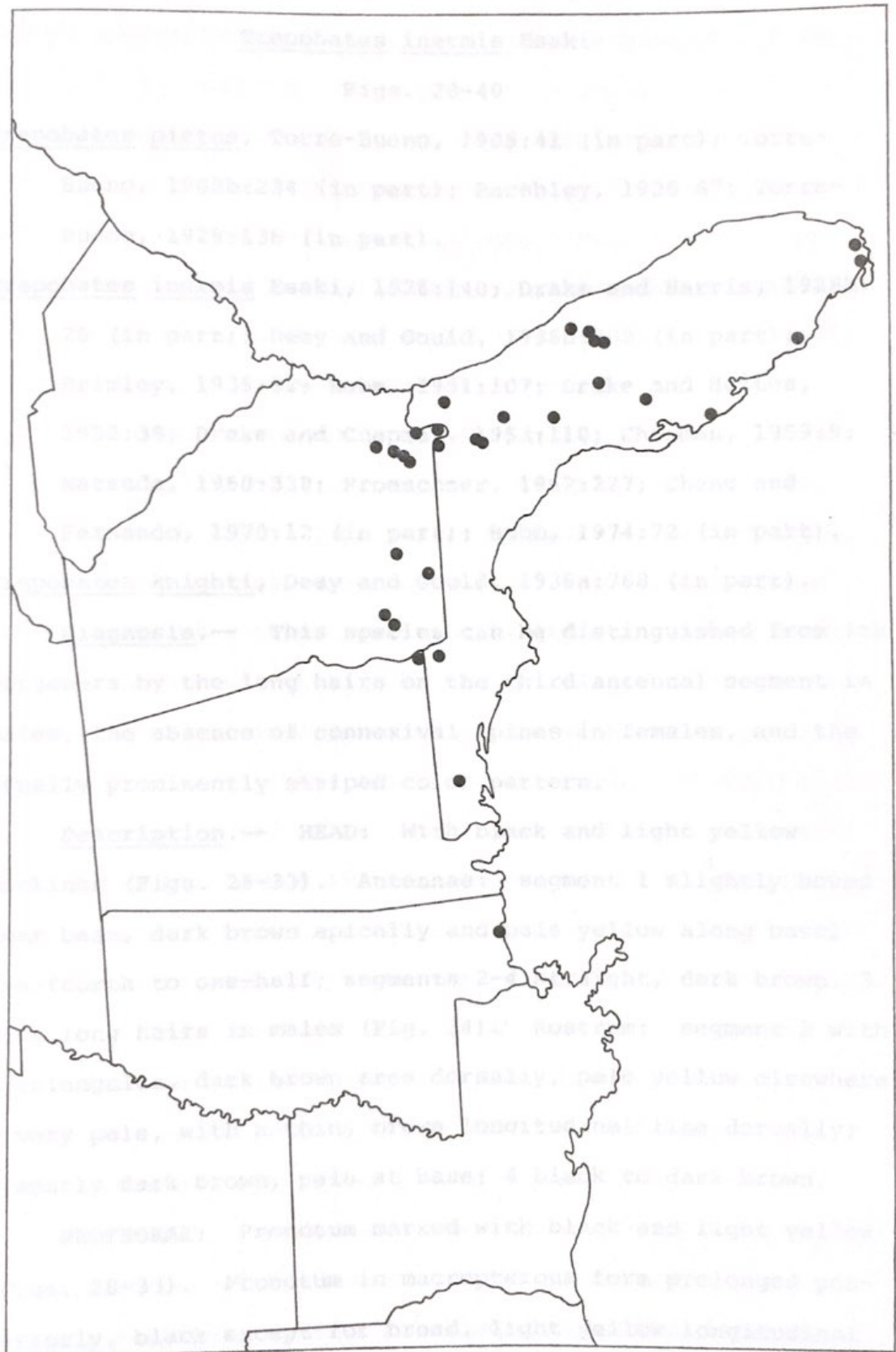


Fig. 27. Distribution of T. floridensis.



Trepobates inermis Esaki

Figs. 28-40

Trepobates pictus, Torre-Bueno, 1905:41 (in part); Torre-Bueno, 1908b:234 (in part); Parshley, 1920:67; Torre-Bueno, 1928:136 (in part).

Trepobates inermis Esaki, 1926:140; Drake and Harris, 1928b:26 (in part); Deay and Gould, 1936b:308 (in part); Brimley, 1938:82; Bobb, 1951:107; Drake and Hottes, 1952:38; Drake and Chapman, 1953:110; Chapman, 1959:9; Matsuda, 1960:338; Froeschner, 1962:227; Cheng and Fernando, 1970:12 (in part); Bobb, 1974:72 (in part).

Trepobates knighti, Deay and Gould, 1936a:768 (in part).

Diagnosis.— This species can be distinguished from its congeners by the long hairs on the third antennal segment in males, the absence of connexival spines in females, and the usually prominently striped color pattern.

Description.— HEAD: With black and light yellow markings (Figs. 28-33). Antennae: segment 1 slightly bowed near base, dark brown apically and pale yellow along basal one-fourth to one-half; segments 2-4 straight, dark brown, 3 with long hairs in males (Fig. 34). Rostrum: segment 1 with a triangular, dark brown area dorsally, pale yellow elsewhere; 2 very pale, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 28-33). Pronotum in macropterous form prolonged posteriorly, black except for broad, light yellow longitudinal

stripes which continue around posterior margin. Prosternum pale yellow. Anterior femur moderately bowed just before middle in males, slightly bowed near base in females; mostly light yellow, with dark brown to black markings dorsally and laterally, a light yellow ring at apex; very slightly constricted at apex in males. Tibia slightly bowed in males, straight in females; mostly dark brown to black, pale yellow at apex. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 28-33), not prolonged posteriorly in females; a very small patch of short, dark hairs along posterior portion of mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum present (Figs. 29 and 32). Black color of mesopleuron extending onto anterior margin of mesosternum, remainder of mesosternum pale yellow. Middle femur with dark brown and pale yellow longitudinal stripes, males with a thick ventral fringe of long, dark brown hairs (Fig. 35); these hairs, at maximum length, approximately 90-110% of the diameter of the femur. Tibia dark brown; males with a single ventral row of long hairs along basal one-third which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 100-110% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum black with a pair of light yellow markings, usually with a median patch of long, dark brown hairs in females. Metasternum pale yellow. Posterior femur

mostly dark brown but with a pale yellow stripe dorsally; without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black and covered with gray-blue bloom in males; tergites with more extensive light yellow markings and less extensive gray-blue bloom in females. Ventrites mostly pale yellow but some black laterally, especially in males; with moderately long, pale pubescence in males; ventrite 7 in females without long hairs posteriorly. Connexival segments mostly light yellow, with black anterior margins; lateral margins of segments 5 and 6 in males with moderately long, dark hairs; segments 3-6 in females with long, dark hairs; connexiva not produced into spines at apex in females.

GENITALIA: Dorsal profile of abdominal segment 8 of males shown in Fig. 36; with long, thick mostly pale pubescence ventrally (Fig. 37), especially at base and sides. Pygophore covered with short pubescence posteriorly. Dorsal shaft of endosoma as in Fig. 38. Paramere shown in Fig. 39.

Measurements.— **HEAD:** Transocular width of male 0.95-0.99 mm (0.97), female 0.97-1.04 mm (1.00). Interocular space of male 0.36-0.41 mm (0.38), female 0.40-0.46 mm (0.42). Antennae: male— 1) 0.99-1.16 mm (1.07), 2) 0.46-0.53 mm (0.49), 3) 0.55-0.66 mm (0.61), 4) 0.60-0.66 mm (0.64); female— 1) 0.73-0.94 mm (0.84), 2) 0.42-0.52 mm (0.46), 3) 0.55-0.64 mm (0.60), 4) 0.56-0.67 mm (0.63).

PROTHORAX: Pronotum: male— 0.78-0.86 mm (0.82) wide,

0.43-0.47 mm (0.45) long; female— 0.83-0.92 mm (0.85) wide, 0.36-0.45 mm (0.40) long. Anterior femur in male 1.37-1.53 mm (1.46), female 1.16-1.45 mm (1.32). Tibia in male 0.95-1.02 mm (1.00), female 0.88-0.99 mm (0.93). Tarsus 1 in male 0.07-0.10 mm (0.08), female 0.07-0.11 mm (0.09). Tarsus 2 in male 0.40-0.45 mm (0.43), female 0.38-0.45 mm (0.43).

MESOTHORAX: Mesonotum: male— 1.35-1.49 mm (1.42) wide, 0.84-0.96 mm (0.91) long; female— 1.65-2.08 mm (1.83) wide, 0.94-1.16 mm (1.04) long. Middle femur in male 1.88-2.22 mm (2.01), female 2.07-2.36 mm (2.21). Tibia in male 3.42-3.89 mm (3.59), female 3.71-4.11 mm (3.93). Tarsus 1 in male 1.06-1.29 mm (1.14), female 1.16-1.33 mm (1.28). Tarsus 2 in male 0.86-0.99 mm (0.93), female 0.96-1.16 mm (1.04).

METATHORAX: Posterior femur in male 2.58-2.89 mm (2.69), female 2.63-3.06 mm (2.84). Tibia in male 1.29-1.52 mm (1.42), female 1.42-1.65 mm (1.54). Tarsus 1 in male 0.50-0.62 mm (0.56), female 0.53-0.66 mm (0.61). Tarsus 2 in male 0.33-0.40 mm (0.36), female 0.36-0.44 mm (0.39).

SIZE: Length— male 3.22-3.47 mm (3.34), female 3.54-4.31 mm (3.81). Width— male 1.35-1.49 mm (1.42), female 1.65-2.08 mm (1.83).

Type Data.— Two male and two female syntypes are deposited in the Hungarian Natural History Museum, Budapest, and one male and one female were examined. The type specimens were collected by Horvath on September 5, 1907, from Plummerville Island. The type locality is an island in the Potomac River near Cabin John, Montgomery County, Maryland.

Taxonomy.— T. inermis has been greatly confused with T. subnitidus both in collections and in the literature since its original description by Esaki (1926) (see synonymy under T. subnitidus). This confusion largely may be attributed to the improper discrimination between these two species by Drake and Harris (1932b). Both Esaki (1926) and Drake and Harris (1932b) failed to observe the long hairs on the third antennal segment of male T. inermis. Drake and Chapman (1953) properly distinguished T. inermis and subnitidus, but these two species are still confused by some workers. Deay and Gould (1936a) misidentified Indiana specimens of T. inermis as knighti. June through October. One adult was collected.

T. inermis can be easily separated from all other members of the genus except T. knighti by the presence of long hairs on the third antennal segment of males. Although very similar to T. knighti, this species differs from it in the following characters: (1) connexival spines never present in females; (2) more prominently striped color pattern with more intense yellow color; (3) shorter first antennal segment in females; and (4) lighter pubescence on abdominal segment 8 in males. T. inermis also has a characteristic facies that can be used to distinguish it from T. knighti, but this facies is difficult to describe.

Intraspecific Variation.— Although highly variable in color pattern (Figs. 28-33), the large majority of specimens examined had a color pattern as in Fig. 29 or 32. Females usually have a median patch of metanotal hairs, but these

hairs were often absent. Although wing dimorphism does occur in T. inermis, the macropterous form is rare and represented only 2% of the specimens examined.

Natural History.— This water strider is a fairly common inhabitant of lotic bodies of water throughout its range. The only records of this species from lentic habitats are the one listed below from Echo Lake, Westfield, New Jersey, and that of Chapman (1959) for a lake in New Jersey. T. inermis was collected in association with Rheumatobates rileyi and Metrobates hesperius during the present investigation. Collection records are recorded below for each month from June through October. One adult was collected during this investigation while feeding on an adult midge (Chironomidae), and another was feeding on an adult leafhopper (Cicadellidae); two pairs were taken in copula, one in August and one in September. No investigations on the life history of this species have been undertaken.

Distribution.— T. inermis is known from much of the eastern United States and Ontario, Canada (Fig. 40); previous literature records from outside this area are based on misidentified T. subnitidus and taylori. The single record from Iowa listed below is based upon five male specimens examined by me. All specimens are undoubtedly T. inermis, but this record is not noted on Fig. 40 because it is believed that the specimens probably were mislabeled.

Material Examined.— CANADA: Ontario: Lincoln Co.: Jordan, Aug. 24, 1961, 1m (CNC).

UNITED STATES: Connecticut: Litchfield Co.: Terryville, Aug. 2, 1957, 1m, 1f (USNM). Florida: Calhoun Co.: Chipola R. at Hwy. 71 bridge, Aug. 12, 1972, 1f, Sept. 12, 1972, 2f, Sept. 26, 1972, 1f (FAMU). Georgia: Muscogee Co.: Flat-rock Pk., Aug. 8, 1953, 1m, 4f (USNM). Indiana: Allen Co.: Sept. 14, 1933, 1f (PU). Bartholomew Co.: Oct. 15, 1932, 1m (USNM), 1m (PU). Clay Co.: June 21, 1934, 1f (PU). Decatur Co.: Oct. 15, 1932, 1m (PU). Huntington Co.: Sept. 14, 1933, 1f (PU). Johnson Co.: Oct. 15, 1932, 1f (PU). Marion Co.: Sept. 16, 1924, 1f (FMNH), 1f (PU). Monroe Co.: Sept. 10, 1932, 2m, 2f (PU). Parke Co.: July 29, 1934, 1f (PU), Aug. 28, 1932, 1f (USNM). Putnam Co.: Sept. 10, 1932, 1m, 1f (PU). Ripley Co.: Oct. 15, 1932, 2m, 1f (PU), 1f (USNM). Tippecanoe Co.: Aug. 20, 1933, 2f (PU); 5 mi. N of Lafayette, Sept. 11, 1973, 3m, 4f (UG). Wabash Co.: July 11, 1933, 1f (PU). Wayne Co.: West Fork Whitewater R., 4 mi. S of Hagerstown, Sept. 11, 1976, 7m, 8f (PDK). Iowa: Story Co.: Ames, Sept., 1931, 5m (LSU). Kentucky: Casey Co.: Brushy Fork, 3 mi. N of Liberty, Oct. 10, 1971, 2f (INHS). Franklin Co.: Frankfort, Sept. 30, 1916, 2m, 1f (UK). Oldham Co.: Floyds Fork, 2 mi. SSE of Balladsville, Oct. 26, 1973, 4m, 5f (INHS). Rowan Co.: Sept. 26, 1933, 1f (PU). Shelby Co.: Salt R., 5.5 mi. S of Shelbyville, Oct. 26, 1973, 2m, 1f (INHS). Maryland: Montgomery Co.: Great Falls, 1f (CU); Cabin John, Aug. 5, 1944, 2m, 2f (USNM); Glen Echo, June 10, 1893, 1f (ISU), June 10, 1895, 1f (CU), July 2, 1898, 1m (CU), July 8, 1893,

1f (USNM), Sept. 4, 1893, 1m (UKL), Sept. 6, 1f (CU), Oct. 4, 1892, 1f (USNM), Oct. 8, 1893, 1f (UKL), Oct. 16, 1892, 1m (LSU); Plummers Island, June 28, 1914, 1m (AMNH), 2f (CAS), July 1, 1963, 1f (ISU), Sept. 5, 1905, 1f (USNM), Sept., 1907, 1m, 1f (syntypes) (HNHM). Prince Georges Co.: Beltsville, Oct. 2, 1932, 1m (UKL). County unknown: Lalse-land, Sept. 12, 1931, 9m, 9f (UKL). Massachusetts: Hampden Co.: Agawam, Sept. 5, 1899, 2m (CU). Hampshire Co.: Northampton, Aug. 22, 1919, 2f, Oct. 4, 1921, 1m (CAS). Michigan: Monroe Co.: Sept. 14, 1933, 1m (PU). Sanilac Co.: Black R., Aug. 15, 1937, 1f (UMAA). New Jersey: Mercer Co.: Hightstown, Aug. 28, 1957, 1f (HCC). Middlesex Co.: Cranbury, Aug. 30, 1957, 2m, 6f (HCC), 2m (JTP); New Brunswick, Sept. 6, 1957, 1m (JTP), Sept. 16, 1957, 5m, 12f (USNM), 1f (BMNH). Somerset Co.: Watchung, Oct. 9, 1957, 1m, 1f (FSCA), 1m, 3f (HCC), 1m, 2f (JTP). Union Co.: Echo L., Westfield, Sept. 2, 1904, 1m, 6f (AMNH), 1f (RU), 1m (BMNH), 5m, 15f (UKL). New York: Broome Co.: Sept. 17, 1933, 1m, 1f (PU). Erie Co.: Hamburg, July 14, 1906, 3m, 1f (CAS). St. Lawrence Co.: Canton, Sept. 19, 1967, 2m (YU). Suffolk Co.: Cold Spring Harbor, Aug. 1, 1920, 1m (UMAA). Tompkins Co.: Ithaca, June 29, 1886, 1f (CU), July 1, 1886, 1f (LACM), July 22, 1890, 1m (MSU), 2m (AMNH), July 27, 1894, 3m, 5f (CU), July 28, 1891, 1m, 6f (LACM), July 29, 1895, 1m, 2f (OSU), 1f (ISU), July 31, 1894, 3m, 1f (UMSP), 1m (CU), Aug. 5, 1891, 1f (LACM), Aug. 15, 1928, 15m, 12f (CNC), Aug. 31, 1889, 1m (USNM), 2m, 1f (CU), Sept.

3, 1889, 1f (CU). Westchester Co.: White Plains, Aug., 1908, 2m, 2f (UKL), July 2, 1908, 1f (BMNH), July 4, 1908, 4f (UKL). Ohio: Ashtabula Co.: Conneaut Cr., 3 mi. S of Conneaut, Oct. 7, 1973, 9m, 5f (PDK). Butler Co.: Oxford, Sept. 25, 1953, 1f, Sept. 26, 1949, 1m, 3f, Sept. 27, 1962, 1f, Sept. 29, 1952, 1f, Oct. 7, 1946, 1m, 2f, Oct. 17, 1963, 1m (MUO); Indian Cr., Oct. 2, 1973, 2m (MUO). Cuyahoga Co.: Berea, July 16, 1914, 2m, 2f (OSU), 1f (UNH). Defiance Co.: Sept. 14, 1933, 1m (PU). Fairfield Co.: Sugar Grove, June 11, 1917, 2f (USNM). Franklin Co.: Columbus, Sept. 19, 1914, 1m (BMNH), Sept. 20, 1913, 1m (CAS), Oct. 7, 1914, 1m, 1f (USNM), Oct. 9, 1913, 1m, 3f (OSU). Greene Co.: Little Miami R., Spring Valley Twp., Sept. 1, 1976, 2m, 5f (DMNH). Hocking Co.: Rockbridge, June 12, 1915, 1f (USNM). Licking Co.: Newark, July 12, 1920, 1m (OSU). Medina Co.: Sept. 20, 1939, 1m, 3f (PU). Montgomery Co.: Stillwater R., Dayton, Aug. 26, 1976, 8m, 12f (DMNH); Miami R., Taylorsville Dam, Aug. 21, 1976, 1f, Aug. 26, 1976, 11m, 27f (DMNH). Perry Co.: Shawnee, Sept. 2, 1968, 3m, 2f (UMC). Seneca Co.: Tiffin, Aug. 26, 1916, 1m (USNM). Trumbull Co.: Grand R., 5 mi. NNW of Southington, Sept. 6, 1976, 3m, 16f (PDK); Swine Creek, 1.5 mi. NW of West Farmington, July 28, 1972, 5m, 5f, Aug. 4, 1975, 6m, 8f, Sept. 7, 1976, 10m, 15f, Sept. 16, 1973, 17m, 18f (PDK). Williams Co.: Sept. 14, 1933, 1m, 1f (PU). County unknown: Deer Cr., Aug. 26, 1920, 1m (OSU); East Fork Mahoning R., Aug. 18, 1920, 1f (OSU); West Fork Mahoning R., Aug. 18, 1920, 1f (OSU).

Pennsylvania: Adams Co.: Arendtsville, July 12, 1921, 1m (UKL). Bedford Co.: Aug. 5-7, 2f (CU), 1f (AMNH). Berks Co.: Tuckerton, July, 1899, 4f (FMNH), 1f (CAS). Lancaster Co.: Conestoga R., Aug. 1, 1947, 1f (FSCA). Westmoreland Co.: Greensburg, Oct. 20, 1904, 1m, 1f (LEM), 1f (UKL). York Co.: 5 mi. NW of Davidsburg, July 5, 1961, 5m, 1f (USNM). Tennessee: Knox Co.: Knoxville, July 4, 1891, 1f (LSU). Polk Co.: Hiawasee R., 1 mi. N of Turtletown, Sept. 8, 1973, 3m, 2f (UG). County unknown: Coal Creek, Aug. 27, 1930, 67m, 94f (UKL). Virginia: Albemarle Co.: Oct. 30, 1947, 1m (VPI). Loudoun Co.: Round Hill, 1f (CU). Montgomery Co.: Blacksburg, Oct. 8, 1954, 1f (VPI). Nelson Co.: June 19, 1947, 1f (VPI). Prince William Co.: Occoquan, 1f (CU). Rockbridge Co.: Sept. 25, 1933, 1f (PU). West Virginia: Monongalia Co.: Morgantown, July, 1927, 1m, 2f (LSU). Preston Co.: Aurora, Aug. 2, 1904, 2f (CU), Aug. 13-15, 1904, 1m, 2f (LSU), 1f (USNM). Randolph Co.: Leading Cr., Kerens, Sept. 8, 1976, 63m, 67f (PDK). Tucker Co.: Shavers Fork Cheat R., 4 mi. SW of Parsons, Sept. 8, 1976, 6m, 4f (PDK); Dry Fork Blackfork R., Hendricks, Sept. 8, 1976, 11m, 13f (PDK); Shavers Fork Cheat R., Parsons, Sept. 8, 1976, 5f (PDK).

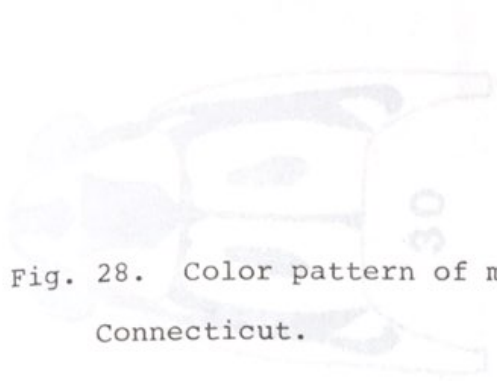


Fig. 28. Color pattern of male T. inermis, Litchfield Co., Connecticut.

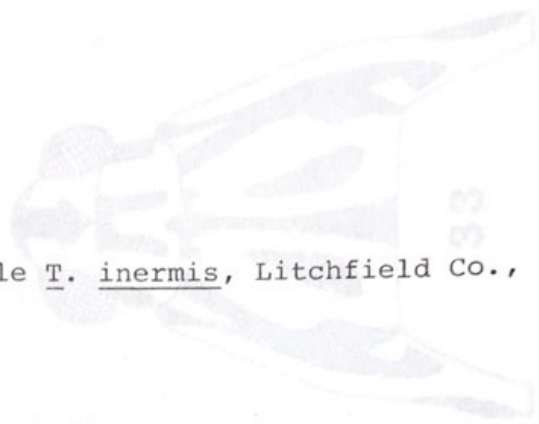


Fig. 29. Color pattern of male T. inermis, Trumbull Co., Ohio. MSP, mesopleural spot.

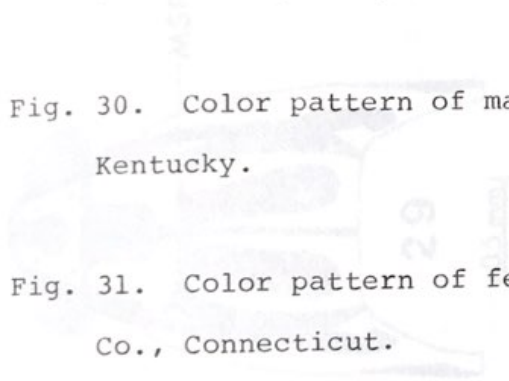


Fig. 30. Color pattern of male T. inermis, Franklin Co., Kentucky.

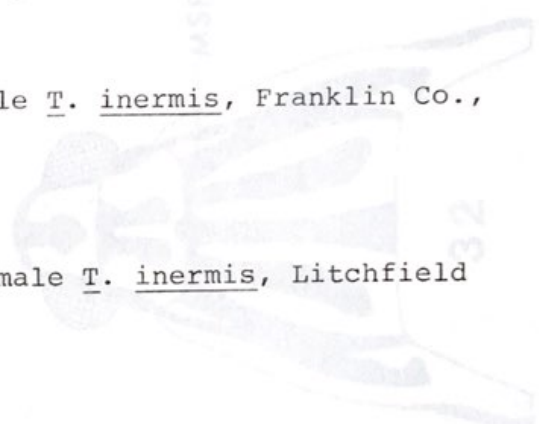


Fig. 31. Color pattern of female T. inermis, Litchfield Co., Connecticut.

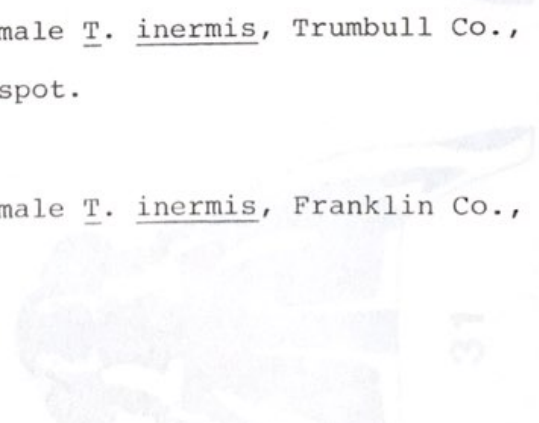


Fig. 32. Color pattern of female T. inermis, Trumbull Co., Ohio. MSP, mesopleural spot.

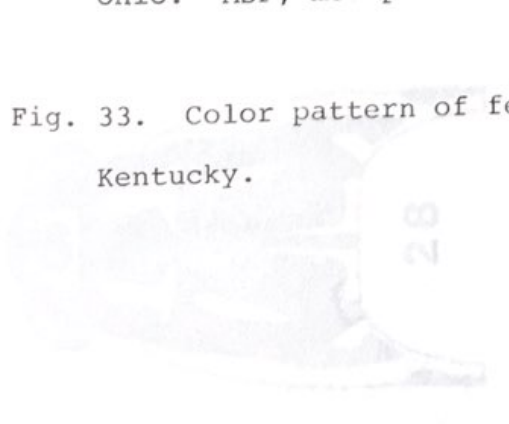


Fig. 33. Color pattern of female T. inermis, Franklin Co., Kentucky.

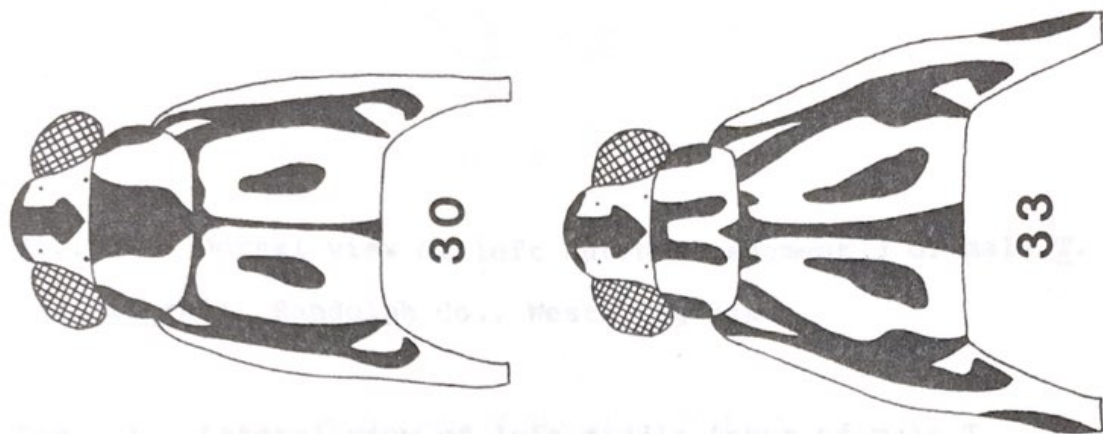


Fig. 33. Lateral view of left middle femur of male *Y. incornis*, Randolph Co., West Virginia.

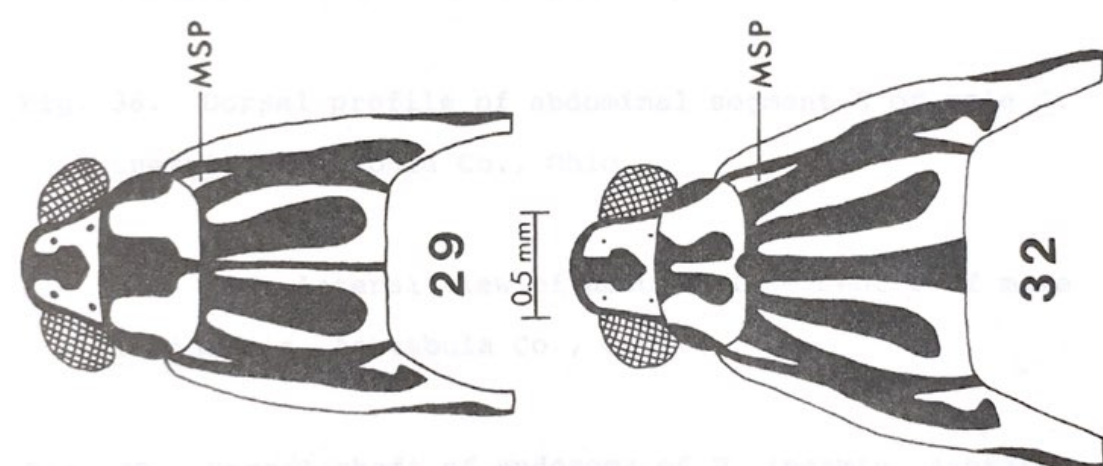


Fig. 32. Dorsal profile of abdominal segments of male *Y. incornis*, Randolph Co., West Virginia.

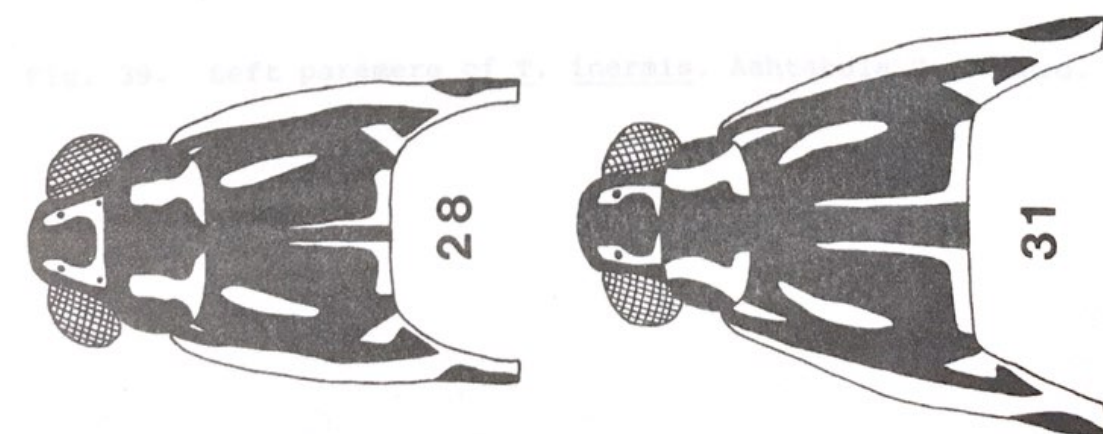


Fig. 31. Left paramere of *Y. incornis*, Randolph Co., West Virginia.

34

Fig. 34. Dorsal view of left antennal segment 3 of male T. inermis, Randolph Co., West Virginia.

Fig. 35. Lateral view of left middle femur of male T. inermis, Randolph Co., West Virginia.

Fig. 36. Dorsal profile of abdominal segment 8 of male T. inermis, Ashtabula Co., Ohio.

Fig. 37. Left lateral view of abdominal segment 8 of male T. inermis, Ashtabula Co., Ohio.

Fig. 38. Dorsal shaft of endosoma of T. inermis, Ashtabula Co., Ohio.

Fig. 39. Left paramere of T. inermis, Ashtabula Co., Ohio.

38

39



34



35

Fig. 43. Dissections of *T. lachrym.*



36

0.5 mm



37



38

0.1 mm



39

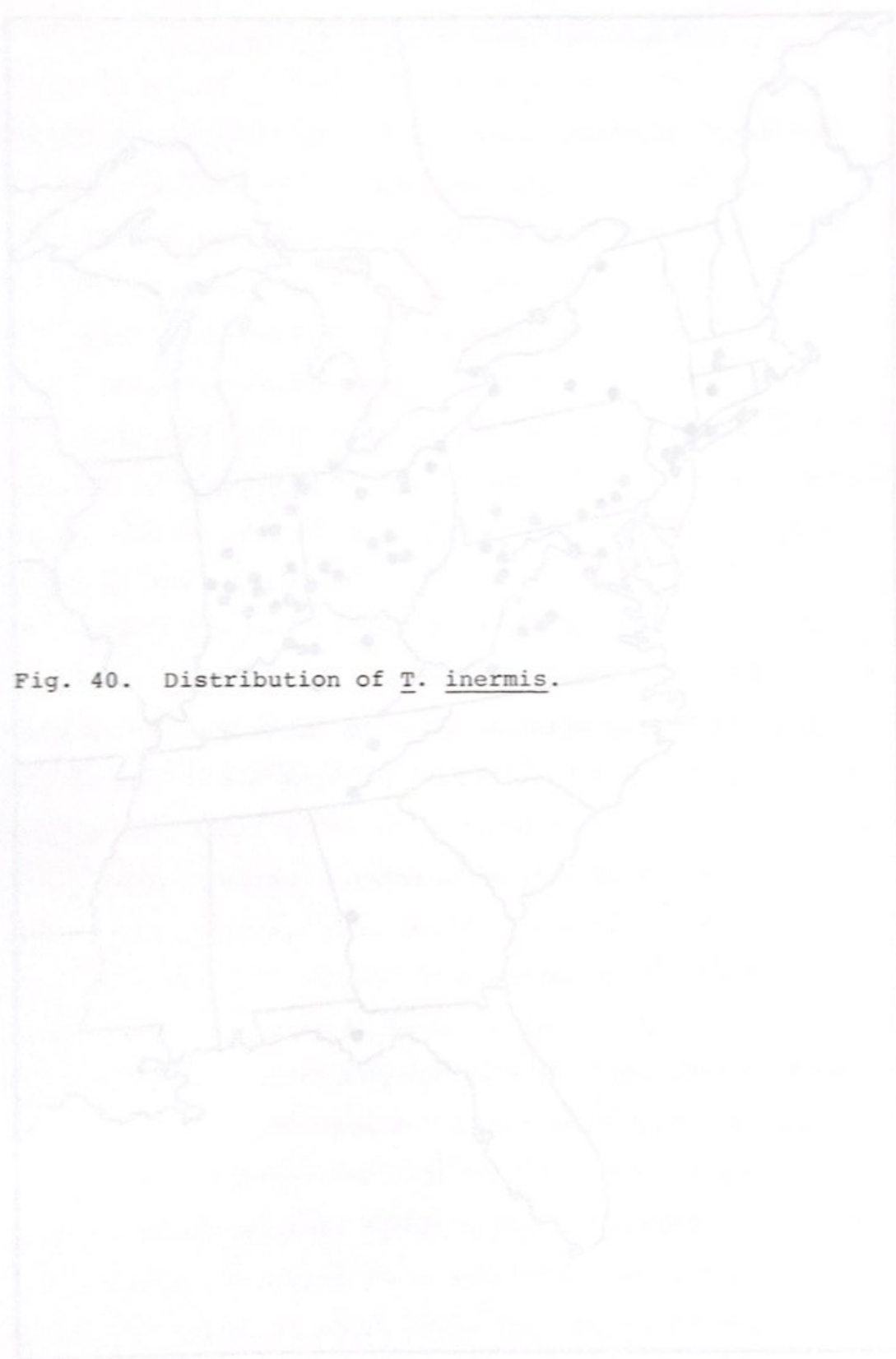
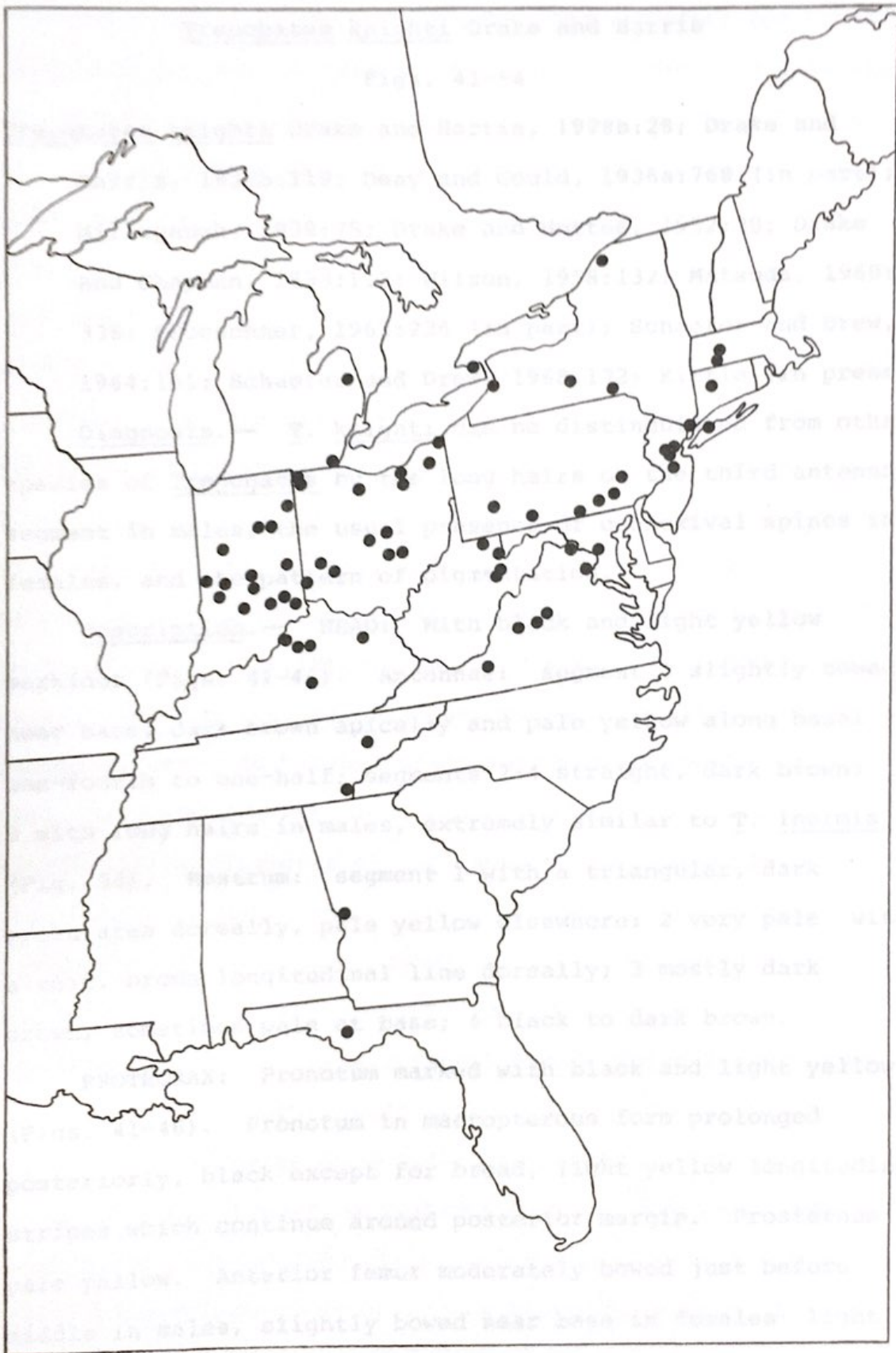


Fig. 40. Distribution of T. inermis.



Trepobates knighti Drake and Harris

Figs. 41-54

Trepobates knighti Drake and Harris, 1928b:28; Drake and Harris, 1932b:118; Deay and Gould, 1936a:768 (in part); Millspaugh, 1939:75; Drake and Hottes, 1952:38; Drake and Chapman, 1953:112; Wilson, 1958:132; Matsuda, 1960:338; Froeschner, 1962:226 (in part); Schaefer and Drew, 1964:101; Schaefer and Drew, 1968:132; Kittle (in press).

Diagnosis.— T. knighti can be distinguished from other species of Trepobates by the long hairs on the third antennal segment in males, the usual presence of connexival spines in females, and the pattern of pigmentation.

Description.— HEAD: With black and light yellow markings (Figs. 41-46). Antennae: segment 1 slightly bowed near base, dark brown apically and pale yellow along basal one-fourth to one-half; segments 2-4 straight, dark brown; 3 with long hairs in males, extremely similar to T. inermis (Fig. 34). Rostrum: segment 1 with a triangular, dark brown area dorsally, pale yellow elsewhere; 2 very pale, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, sometimes pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 41-46). Pronotum in macropterous form prolonged posteriorly, black except for broad, light yellow longitudinal stripes which continue around posterior margin. Prosternum pale yellow. Anterior femur moderately bowed just before middle in males, slightly bowed near base in females; light

yellow with dark brown to black markings dorsally and laterally, a light yellow ring at apex; very slightly constricted at apex in males. Tibia slightly bowed in males, straight in females; mostly dark brown to black, pale yellow at apex, females sometimes with a pale yellow dorsal stripe. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 41-46), not prolonged posteriorly in females; a small patch of short, dark hairs along posterior portion of mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum present (Figs. 42 and 45). Black color of mesopleuron extending onto anterior margin of mesosternum, remainder of mesosternum pale yellow. Middle femur with dark brown and pale yellow longitudinal stripes, males with a thick ventral fringe of long, dark brown hairs very similar to T. inermis (Fig. 35); these hairs, at maximum length, approximately 90-120% of the diameter of the femur. Tibia dark brown; males with a single ventral row of long hairs along basal one-third which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 100-110% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum black with a pair of light yellow markings, these markings occasionally absent; sometimes with a median patch of long, dark brown hairs in females. Metasternum pale yellow. Posterior femur dark brown, sometimes pale yellow dorsally; without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites almost entirely black and covered with a gray-blue bloom in males; tergites with more extensive light yellow markings and less extensive gray-blue bloom in females. Ventrites mostly pale yellow but some black laterally, especially in males; with moderately long, pale pubescence in males; ventrite 7 in females without long hairs posteriorly. Connexival segments mostly light yellow, with black anterior margins; lateral margins of segments 5 and 6 in males with moderately long, dark hairs; segments 3-6 in females with long, dark hairs; connexiva usually produced into long, hairy spines at apex in females (Fig. 47), sometimes with spines reduced (Fig. 48) or absent (Fig. 49).

GENITALIA: Dorsal profile of abdominal segment 8 of males shown in Fig. 50; with long, thick mostly dark pubescence ventrally (Fig. 51). Pygophore covered with short pubescence posteriorly. Dorsal shaft of endosoma shown in Fig. 52. Paramere as in Fig. 53.

Measurements.— **HEAD:** Transocular width of male 0.89-1.02 mm (0.96), female 0.93-1.05 mm (0.99). Interocular space of male 0.36-0.42 mm (0.39), female 0.40-0.45 mm (0.42). Antennae: male— 1) 0.88-1.17 mm (1.03), 2) 0.43-0.55 mm (0.51), 3) 0.55-0.69 mm (0.62), 4) 0.55-0.69 mm (0.61); female— 1) 0.83-0.99 mm (0.91), 2) 0.43-0.51 mm (0.48), 3) 0.50-0.66 mm (0.59), 4) 0.57-0.66 mm (0.62).

PROTHORAX: Pronotum: male— 0.75-0.85 mm (0.81) wide, 0.42-0.50 mm (0.44) long; female— 0.76-0.92 mm (0.85) wide, 0.37-0.44 mm (0.40) long. Anterior femur in male 1.26-

1.49 mm (1.37), female 1.19-1.42 mm (1.32). Tibia in male 0.89-1.02 mm (0.99), female 0.86-1.04 mm (0.96). Tarsus 1 in male 0.07-0.10 mm (0.08), female 0.07-0.11 mm (0.09). Tarsus 2 in male 0.36-0.41 mm (0.39), female 0.39-0.46 mm (0.42).

MESOTHORAX: Mesonotum: male— 1.16-1.49 mm (1.37) wide, 0.83-0.93 mm (0.88) long; female— 1.65-1.88 mm (1.77) wide, 0.99-1.14 mm (1.07) long. Middle femur in male 1.70-2.25 mm (2.04), female 1.84-2.45 mm (2.26). Tibia in male 2.94-4.13 mm (3.66), female 3.16-4.43 mm (4.03). Tarsus 1 in male 1.02-1.31 mm (1.15), female 1.12-1.42 mm (1.28). Tarsus 2 in male 0.78-0.96 mm (0.89), female 0.89-1.12 mm (1.03).

METATHORAX: Posterior femur in male 2.17-3.06 mm (2.73), female 2.36-3.09 mm (2.84). Tibia in male 1.23-1.62 mm (1.48), female 1.34-1.76 mm (1.63). Tarsus 1 in male 0.52-0.63 mm (0.57), female 0.59-0.70 mm (0.64). Tarsus 2 in male 0.31-0.37 mm (0.35), females 0.33-0.42 mm (0.39).

SIZE: Length— male 2.80-3.47 mm (3.17), female 3.32-4.26 mm (3.80). Width— male 1.16-1.49 mm (1.37), female 1.65-1.88 mm (1.77).

Type Data.— The male holotype and female allotype are in the Drake Collection, U.S. National Museum, and were examined during this study. The above specimens were collected from Turkey Creek, Hollister, Missouri, by H. H. Knight during September 5-10, 1925. Paratypes from Iowa and Missouri were examined from the following collections: CAS, CNC, FMNH, INHS, ISU, UKL, and USNM.

Taxonomy.— T. knighti has not been frequently confused with other species of Trepobates in the past. Deay and Gould (1936a) misidentified T. inermis from Indiana as T. knighti. Froeschner (1962) included some females of T. subnitidus under his treatment of T. knighti because they possessed similar connexival spines; however, this form of T. subnitidus is quite distinct from T. knighti and is discussed under T. subnitidus (see page 133).

T. knighti is easily distinguished from all species of Trepobates except T. inermis by the presence of long hairs on the third antennal segment of males. Differences between T. knighti and inermis have been presented in the taxonomy section for the latter species (see page 54).

Intraspecific Variation.— This species is highly variable in color pattern, but the majority of specimens examined most closely resembled Fig. 42 or 45. A median patch of metanotal hairs was present on about one-fourth of the specimens examined but absent from the remainder. Although the great majority of females studied had long connexival spines (Fig. 47), some specimens had these spines reduced or absent (Figs. 48 and 49). The distribution map for T. knighti (Fig. 54) shows the occurrence of the different forms. The macropterous form is rare and only 1% of the specimens examined were winged.

Natural History.— T. knighti is a common water strider on lotic habitats throughout much of its range and is only rarely taken from lentic bodies of water. This species was

commonly collected in close association with T. subnitidus, Rheumatobates palosi, and R. tenuipes and was occasionally taken with T. pictus, Gerris marginatus, G. remigis, R. trulliger, R. hungerfordi, and Metrobates hesperius during this study. T. knighti has been collected each month from May through October, and Froeschner (1962) reported that specimens had been collected in November in Missouri. A single specimen was taken while preying on a very small adult terrestrial dipteran. Several pairs were collected in copula from July through October. One specimen taken in Crawford County, Arkansas, had a single small mite on the pronotum and one on the meta-acetabulum; it is not known whether these mites were parasitic or phoretic. A macropterous specimen captured at a blacklight in Montgomery County, Arkansas, was presented to me by Mr. Rob Chenowith. Life history information on T. knighti is presented in a later section.

Distribution.— This species has been collected only in the central United States (Fig. 54). New state records are listed below for Louisiana, Minnesota, and South Dakota.

Material Examined.— UNITED STATES: Arkansas: Baxter Co.: Sept. 12, 1932, 1f (PU). Boone Co.: Sept. 12, 1932, 1f (PU); Crooked Cr., Harrison, Sept. 28, 1976, 5m, 4f (PDK). Carroll Co.: Sept. 12, 1932, 1f (PU), Sept. 17, 1932, 1f (USNM), 1f (UKL). Cleburne Co.: Aug. 16, 1970, 1m, 1f (MSUM). Crawford Co.: Mulberry R., 3 mi. N of Mulberry, Oct. 11, 1975, 5m, 4f (PDK); Mountain Fork Cr., Natural Dam,

Sept. 30, 1973, 7m, 7f (PDK); Howard Cr., Chester, Sept. 30, 1973, 14m, 9f (PDK). Fulton Co.: Myatt Cr., 8 mi. S of Mammoth Spring, Sept. 11, 1976, 1f (GLH); South Fork Spring R., 1 mi. NE of Salem, Sept. 28, 1976, 22m, 23f (PDK). Hot Spring Co.: stream, 1 mi. E of Point Cedar, July 29, 1975, 6m, 3f (PDK). Johnson Co.: Dirty Cr., 4 mi. N of Coal Hill, June 16, 1975, 21m, 9f (PDK); Hurricane Cr., 2 mi. NE of Fort Douglas, Oct. 13, 1974, 5m, 1f (PDK). Lawrence Co.: Sept. 12, 1932, 2f (PU); Spring R., Imboden, Sept. 28, 1976, 1f (PDK). Logan Co.: Rock Cr., 3.5 mi. E of Abbott, June 17, 1976, 6m, 13f (PDK); Little Six-mile Cr., Chismville, July 4, 1975, 8m, 6f (PDK). Madison Co.: East Fork White R., Patrick, Oct. 11, 1975, 5m, 5f (PDK). Marion Co.: Sept. 12, 1932, 1f (PU); Crooked Cr., Pyatt, Sept. 28, 1976, 10m, 7f (PDK); Buffalo R., 1.5 mi. E of Rush, June 24, 1973, 1m, 5f (PDK). Montgomery Co.: blacklight, 8.5 mi. NE of Caddo Gap, July 22, 1976, 1f (PDK). Newton Co.: Buffalo R., 2 mi. W of Hasty, June 25, 1974, 2m, 1f (PDK); Buffalo R., 5 mi. SE of Pruitt, June 25, 1974, 2m, 2f (PDK); Buffalo R., 0.5 mi. E of Ponca, June 24, 1972, 3m, 4f (PDK); Little Buffalo R., Jasper, June 24, 1972, 9m, 5f (PDK). Pike Co.: Prairie Cr., 1.5 mi. SSE of Murfreesboro, July 29, 1975, 83m, 74f (PDK). Polk Co.: Aug. 21, 1928, 56m, 32f (UKL); Six-mile Cr., 2 mi. NE of Cove, June 17, 1976, 3m, 2f (PDK); Cossatot R., 7.5 mi. E of Vandervoort, July 7, 1972, 11m, 8f (PDK); Cove, July 7, 1952, 2f (UKL), 1m, 4f (JTP), 2m (HCC), 1m (ISU). Randolph Co.: Eleven Point R., NW of Dalton,

Sept. 11, 1976, 1f (GLH). Scott Co.: Sugar Cr., 6 mi. NW of Union Hill, July 4, 1975, 18m, 25f (PDK). Sharp Co.: Sept. 12, 1932, 2f (PU), Sept. 14, 1932, 1f (UKL); stream, 2 mi. N of Williford, Sept. 28, 1976, 8m, 15f (PDK). Stone Co.: Sylamore Cr., 4 mi. NW of Allison, Oct. 24, 1976, 1m (PDK). Van Buren Co.: Aug. 15, 1970, 1f (MSUM). Washington Co.: Aug. 12, 1965, 3m (UA); Hamstring Cr., 1.5 mi. S of Wheeler, June 28, 1975, 3f, Aug. 31, 1975, 1m, 1f (PDK); East Fork White R., 1.5 mi. N of Durham, Sept. 28, 1973, 9m, 8f (PDK); Clear Cr., 5.5 mi. NW of Fayetteville, Oct. 22, 1973, 1f (PDK); West Fork White R., 0.5 mi. W of Greenland, Oct. 25, 1972, 1f (PDK); Farmington Branch, Farmington, Oct. 15, 1972, 1m, 2f (PDK); Muddy Fork Cr., 3 mi. NW of Prairie Grove, Oct. 15, 1972, 1f (PDK); Illinois R., 4 mi. W of Farmington, Oct. 15, 1972, 1m, 8f (PDK); Cincinnati Cr., 1 mi. ESE of Cincinnati, Oct. 13, 1972, 4m, 2f (PDK); Ballard Cr., 1 mi. NW of Summers, Oct. 13, 1972, 2f (PDK); Evansville Cr., 3 mi. E of Evansville, Oct. 2, 1972, 4m, 3f (PDK); Fly Cr., Morrow, Oct. 2, 1972, 2m, 1f (PDK); Barren Fork Cr., 2 mi. E of Dutch Mills, Oct. 2, 1972, 10m, 7f (PDK); Illinois R., 3 mi. E of Prairie Grove, Oct. 2, 1972, 6m, 9f (PDK); West Fork White R., 1 mi. S of Greenland, Sept. 30, 1972, 4m, 3f (PDK); West Fork White R., 1 mi. SE of West Fork, Sept. 30, 1972, 1m, 2f (PDK); Lee Cr., 5.5 mi. SSE of Strickler, Sept. 30, 1972, 3m, 1f (PDK); Middle Fork White R., 5.5 mi. SSE of Sulphur City, Sept. 15, 1972, 2m, 1f (PDK); Ellis Branch, 5 mi. SSE of Strickler, Sept. 30, 1972,

6m, 6f (PDK); Middle Fork White R., 2 mi. S of Sulphur City, Sept. 15, 1972, 15m, 9f (PDK); White R., 4.5 mi. E of Fayetteville, Sept. 15, 1972, 14m, 8f (PDK); White R., 5 mi. E of Fayetteville, Aug. 20, 1976, 1m, Sept. 15, 1972, 1m, 1f (PDK); Hamstring Cr., 2 mi. S of Wheeler, Sept. 6, 1972, 16m, 23f (PDK); War Eagle Cr., 4 mi. NE of Spring Valley, Sept. 9, 1972, 11m, 12f (PDK); Clear Cr., Johnson, Sept. 6, 1972, 2m, 5f (PDK); Cove Cr., 2 mi. WSW of Strickler, Aug. 27, 1972, 28m, 26f (PDK); Cove Cr., 6 mi. SW of Strickler, Aug. 27, 1972, 45m, 28f (PDK); Illinois R., 4.5 mi. SE of Prairie Grove, Aug. 27, 1972, 15m, 18f (PDK); Wildcat Cr., 2 mi. W of Harmon, July 1, 1975, 2m, 2f, Aug. 21, 1972, 1m, 2f, Sept. 12, 1973, 2m (PDK); Clear Cr., 1.5 mi. E of Savoy, Aug. 21, 1972, 1m, 1f (PDK); Illinois R., 4.5 mi. W of Farmington, Aug. 21, 1972, 2m, 2f (PDK); Mill Branch, Goshen, Aug. 16, 1972, 1m, 1f (PDK); Cave Cr., 2 mi. SE of Goshen, Aug. 16, 1972, 3m, 7f (PDK); Richland Cr., 4 mi. SSE of Goshen, Aug. 16, 1972, 10m, 10f (PDK); Tuttle Branch, 3 mi. NE of Elkins, Aug. 16, 1972, 1f (PDK); East Fork White R., Elkins, Aug. 16, 1972, 5m, 6f (PDK); Tuttle Branch, 3 mi. E of Elkins, Aug. 16, 1972, 2f (PDK); East Fork White R., 2 mi. N of Durham, Aug. 16, 1972, 3m, 2f (PDK); Middle Fork White R., 1 mi. WNW of Sulphur City, Aug. 16, 1972, 2m, 4f (PDK); Ballard Cr., 0.5 mi. W of Summers, July 18, 1972, 10m, 7f (PDK); small stream, 2 mi. ESE of Fayetteville, June 19, 1972, 16m, 15f (PDK); West Fork White R., 3.5 mi. SE of Fayetteville, June 19, 1972, 8m, 4f, Aug. 16, 1972, 3m, 4f

(PDK); Clear Cr., 2 mi. W of Johnson, June 16, 1972, 10m, 5f (PDK); Middle Fork White R., 3.5 mi. WNW of Elkins, June 19, 1972, 5m, 4f (PDK); Illinois R., 2 mi. NE of Moffit, June 9, 1972, 3m, 5f (PDK); Fall Cr., Strickler, Sept. 30, 1972, 1f (PDK); Brush Cr., Mayfield, Sept. 9, 1972, 1m, 4f (PDK); Kroger Branch, 3 mi. W of Elkins, June 19, 1972, 11m, 6f (PDK). Illinois: Boone Co.: Belvidere, July 1, 1949, 1m, 1f, Sept. 1, 1948, 2m, 1f (UCS). Champaign Co.: St. Joseph, July 29, 1919, 1m, 1f (INHS). Cook Co.: Palos Park, Sept. 13, 1908, 6m, 4f, Sept. 14, 1913, 1m, 2f (FMNH). Iroquois Co.: Martinton, July 10, 1956, 1f (JTP). Jo Daviess Co.: Stockton, Aug. 15, 1956, 1f (JTP). Kankakee Co.: Kankakee, Aug. 22, 1910, 5m, 4f (FMNH). Mercer Co.: Aledo, Aug. 14, 1956, 2f (CSU), 1m, 1f (JTP), 1m (OU). Ogle Co.: White Pine Forest, Aug. 15, 1956, 1f (JTP). Piatt Co.: White Heath, Sept. 16, 1893, 2m, 6f (INHS). Pope Co.: Lusk Cr., June 29, 1967, 2f, July 7, 1967, 6m, July 15, 1967, 6m, 1f, Aug. 4, 1968, 5m, 3f, Aug. 30, 1967, 11m, 9f, Oct. 24, 1967, 1m, 6f, Oct. 31, 1967, 1f (SIU); Grand Pierre Cr., Herod, Aug. 1, 1898, 1m (INHS); Herod, June 23, 1927, 1f (INHS). Scott Co.: Big Sandy Cr., 1 mi. E of Winchester, Sept. 26, 1976, 122m, 124f (PDK). Stark Co.: Wyoming, Aug. 1, 1956, 1m (OU). Union Co.: stream, 5 mi. SE of Anna, Sept. 25, 1976, 123m, 77f (PDK); July 4, 1959, 4m, 9f (JTP), 1m, 2f (BMNH), 1m, 1f (CSU). Vermilion Co.: Muncie, July 3, 1929, 2m (INHS). Will Co.: New Lenox, Oct. 4, 1952, 1f (FMNH). Indiana: Benton Co.: North Fork Vermilion

R., 1 mi. N of Ambia, Sept. 30, 1973, 1f (INHS). Owen Co.:
 Sept. 10, 1932, 1f (PU). Iowa: Clinton Co.: Clinton, Aug.
 18, 1942, 1m, 1f (ISU), 1m (CU). Hamilton Co.: Webster
 City, Aug. 11, 1927, 1f (paratype) (INHS). Henry Co.: Mt.
 Pleasant, July 14, 1927, 3m (paratypes) (USNM), 1m (paratype)
 (ISU), 1f (paratype) (CAS), 1m (paratype) (CNC), 1m (para-
 type) (UKL). Jefferson Co.: Lockridge, Sept. 11, 1942,
 17m, 16f (ISU). Lee Co.: Donnelson, July 13, 1927, 1f
 (paratype) (FMNH), 1f (paratype) (UKL), 1m (paratype) (ISU),
 1m, 1f (paratypes) (USNM), 1m (paratype) (CAS), 1f (para-
 type) (CNC). Monroe Co.: Albia, July 15, 1927, 1f (para-
 type) (INHS), 1m (paratype) (USNM). Page Co.: Clarinda,
 Sept. 10, 1942, 14m, 7f (ISU), 1f (CU). Story Co.: 4 mi.
 E of Gilbert, July 8, 1949, 1f, Oct. 4, 1949, 1f (UCS); Ames,
 July, 1938, 1m (UMSP), July 12, 1929, 2m, 1f (MSUB), 1f
 (TAMU), July 13, 1897, 1m, 1f (paratypes) (ISU), July 14,
 1929, 1m, 1f (WSU), 2m, 6f (ISU), 1m (LSU), 1m, 1f (CAS),
 July 15, 1897, 1m (paratype) (ISU), Aug. 1, 1924, 1f (para-
 type) (ISU), Aug. 6, 1897, 1m (paratype) (ISU), Aug. 6,
 1945, 2m (USNM), 1f (JTP), 1f (HCC), Aug. 21, 1897, 1m, 1f
 (paratypes) (ISU), Aug. 30, 1929, 1m, 5f (ISU), Sept. 6,
 1897, 1f (paratype) (ISU), Sept. 20, 1932, 19m, 15f (ISU),
 1m (WSU), 1m (LSU), Oct. 29, 1952, 1m (USNM). Union Co.:
 Talmage, Sept. 10, 1942, 1m, 3f (ISU), 3f (CU). Wapello
 Co.: Eldon, Sept. 11, 1942, 1m, 4f (ISU). Kansas: Allen
 Co.: Sept. 20, 1932, 1m (PU). Douglas Co.: 12m, 12f (UKL);
 Dykeman's Bridge, July, 1922, 3m, 2f (UKL). Elk Co.: 7m,

6f (UKL). Marion Co.: Cedar Cr., 2 mi. SW of Cedar Point, Sept. 4, 1922, 3m, 3f (UMSP). Neosho Co.: Sept. 20, 1932, 1m, 1f (PU); Oct. 18-19, 1922, 1m, 3f (UMSP); Big Turkey Cr., Chanute, Sept. 24, 1922, 2m, 1f, Sept. 25, 1926, 5m, 4f (UMSP). Riley Co.: Aug. 3, 1m (KSU), Aug. 27, 1m, 1f (KSU), 3m, 3f (LSU), Sept. 4, 2m, 2f (KSU); Manhattan, Sept. 13, 1923, 31m, 37f (UKL). County unknown: Modesha, Aug. 25, 1950, 1m, 1f (USNM). Louisiana: Vernon Par.: Anacoco, July 4, 1952, 1m, 1f (JTP). Minnesota: Le Sueur Co.: July 18, 1923, 2m (UMSP); creek, 3.5 mi. SE of Le Sueur, Sept. 13, 1923, 3f (UMSP). Missouri: Audrain Co.: 3 mi. SSE of Santa Fe, Sept. 22, 1973, 2m, 3f (INHS); 2 mi. N of Molino, Sept. 22, 1973, 1f (INHS); 3 mi. NNW of Molino, Sept. 22, 1973, 1m, 1f (INHS). Barry Co.: Viola, Sept. 24, 1942, 1m, 1f (USNM). Barton Co.: Sept. 17, 1932, 2f (PU), 2f (UKL). Boone Co.: Hunter's Cave area, Aug. 16, 1976, 12m, 18f (UMC); Columbia, no date, 3m, 4f, May 1, 1966, 1m, July 27, 1949, 1m, Aug. 24, 1968, 1m, Sept. 1-3, 1968, 5m, 3f, Sept. 12, 1976, 89m, 62f, Oct. 3, 1961, 1f (UMC), Sept. 19, 1964, 1m, 1f (UWM). Clark Co.: Wayland, Sept. 15, 1942, 1m, 1f (MSU), 1f (USNM). Dallas Co.: Niangua R., 1 mi. SW of Bennett Springs, Aug. 31, 1974, 1f (PDK). Jasper Co.: Sept. 17, 1932, 3f (PU). Jefferson Co.: stream, 4 mi. S of Festus, Sept. 27, 1976, 24m, 45f (PDK). MacDonald Co.: stream, 2 mi. SE of Pineville, Sept. 24, 1976, 8m, 7f (PDK). Monroe Co.: 0.6 mi. N of Florida, Aug. 26, 1973, 1m, 2f (INHS); 0.5 mi. N of Paris, Aug. 25, 1973, 1m (INHS);

3.5 mi. W of Florida, Aug. 26, 1973, 3m, 4f (INHS). Newton Co.: Sept. 17, 1932, 1f (PU). Oregon Co.: Big Piney Cr., Aug. 8, 1930, 1m, 1f (UMAA). Perry Co.: Apple Cr., 0.5 mi. S of Uniontown, Sept. 27, 1976, 16m, 13f (PDK). Phelps Co.: stream, 2 mi. SSW of Jerome, Sept. 24, 1976, 2m, 2f (PDK). Pike Co.: Louisiana, Sept. 2, 1968, 1m, 1f (UMC). Polk Co.: Aldrich, Aug. 29, 1937, 1m (USNM). Reynolds Co.: Black R., 0.5 mi. E of Lesterville, Sept. 1, 1974, 31m, 17f (PDK). Taney Co.: Kisse Mills, Sept. 25, 1940, 1f (USNM); stream, 0.5 mi. W of Ocie, Sept. 2, 1974, 6f (PDK); Turkey Cr., Hollister, Aug. 31, 1974, 4m, 6f (PDK), Sept. 5-10, 1925, 1m (holotype) (USNM), 1f (allotype) (USNM), 1m (paratype) (USNM), 1f (paratype) (ISU). Washington Co.: Big R., 4 mi. N of Caledonia, Sept. 1, 1974, 5m, 6f (PDK). Webster Co.: stream, 1 mi. N of Northview, Sept. 24, 1976, 18m, 29f (PDK). Oklahoma: Bryan Co.: Bokchito, June 21, 1963, 1m, 2f (OSUS). Carter Co.: Ardmore, June 16, 1931, 2f (USNM), 1f (LSU). Creek Co.: Mannford, June 14, 1965, 1f (OSUS). Johnston Co.: farm pond, 1 mi. N of Ravia, May 26, 1975, 22m, 5f, June 26, 1975, 1m (PDK); Little Sandy Cr., 1 mi. N of Ravia, June 26, 1975, 9m, 1f, July 14, 1974, 17m, 29f (PDK); Tishomingo, June 17, 1963, 6m, 4f (OSUS); Pennington Cr., Tishomingo, July 14, 1976, 2f (PDK). Latimer Co.: 2 mi. N of Wilburton, Aug. 6, 1932, 1m, 1f (UMAA). LeFlore Co.: Huggins, July 22, 1963, 1f (OSUS). Marshall Co.: N of Lebanon, July 17, 1963, 1m, 5f (OSUS). McCurtain Co.: N of Eagletown, June 14, 1963, 1m, 3f (OSUS). Murray

Co.: Davis, July, 1925, 29m, 19f (UKL). Muskogee Co.:
 Greenleaf St. Pk., Aug. 14, 1962, 2f (OSUS). Ottawa Co.:
 Fairland, Sept. 24, 1932, 3m, 3f (UKL); Five Mile Cr.,
 Sept. 20, 1932, 2m, 2f (UKL); Cowskin R., Sept. 26, 1932,
 2m, 6f (UKL). Pawnee Co.: July 17, 1932, 1f (OSUS). Payne
 Co.: L. Carl Blackwell, Aug. 16, 1963, 1m, 5f (OSUS).
 Pontotoc Co.: Fittstown, June 14, 1963, 2m, 1f (OSUS).
 Pushmataha Co.: Honobia, June 22, 1963, 1m, 1f (OSUS).
South Dakota: Brookings Co.: Brookings, Sept. 27, 1922, 1m
 (SDSU). Texas: Sabine Co.: stream, 9 mi. SE of Patroon,
 June 17, 1976, 13m, 23f (PDK).

Fig. 43. Color pattern of male *T. knighti*. Sabine Co.,

Texas.

Fig. 44. Color pattern of female *T. knighti*. Story Co.,

Iowa.

Fig. 45. Color pattern of female *T. knighti*, Washington

Co., Arkansas. MSP, mesopleural spot.

Fig. 46. Color pattern of female *T. knighti*. Sabine Co.,

Texas.

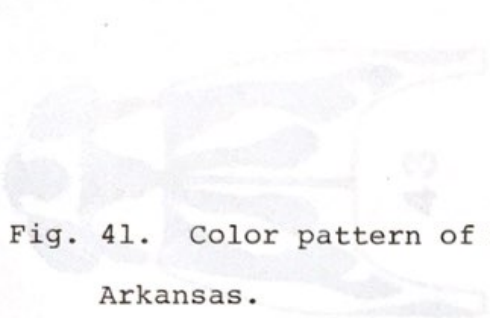


Fig. 41. Color pattern of male T. knighti, Washington Co.,
Arkansas.

Fig. 42. Color pattern of male T. knighti, Washington Co.,
Arkansas. MSP, mesopleural spot.

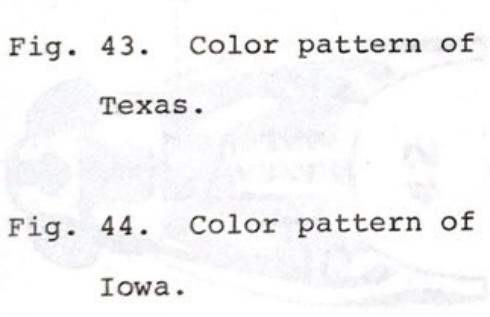


Fig. 43. Color pattern of male T. knighti, Sabine Co.,
Texas.

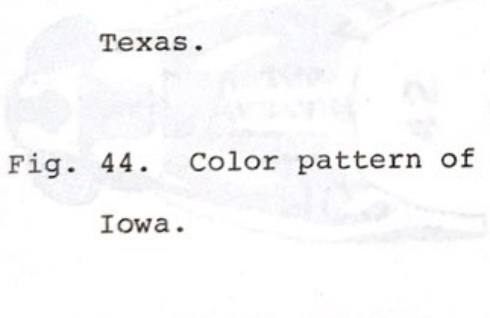


Fig. 44. Color pattern of female T. knighti, Story Co.,
Iowa.

Fig. 45. Color pattern of female T. knighti, Washington
Co., Arkansas. MSP, mesopleural spot.

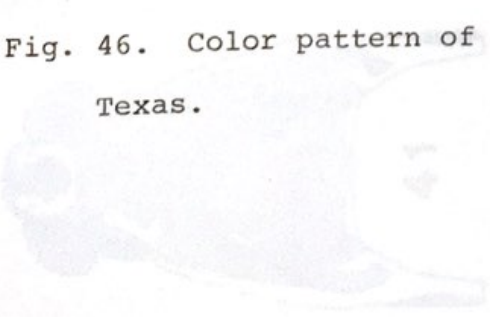


Fig. 46. Color pattern of female T. knighti, Sabine Co.,
Texas.

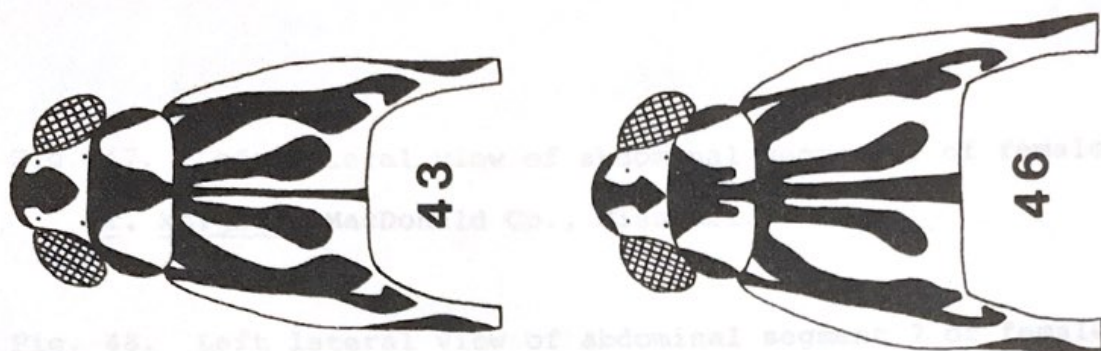


Fig. 43. Left lateral view of abdominal segment 7 of female *T. knighti*, Scott Co., Illinois.

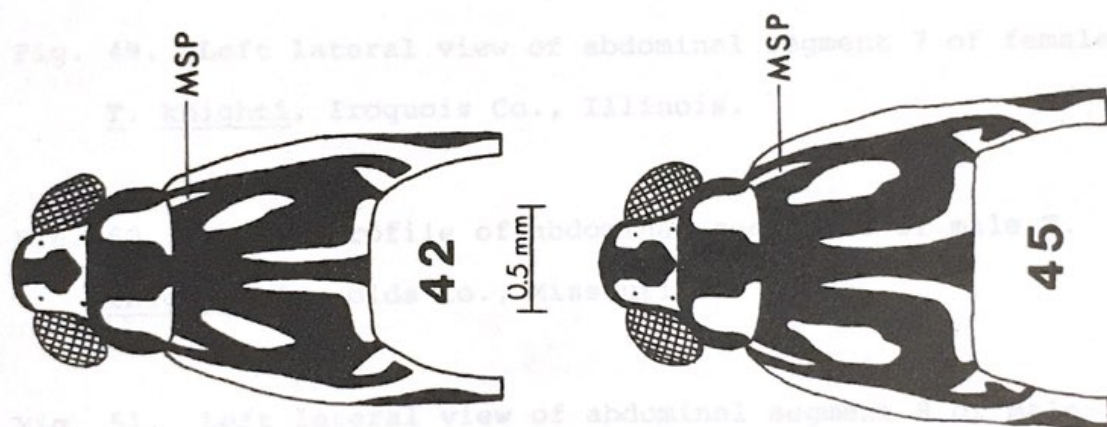


Fig. 45. Left lateral view of abdominal segment 7 of female *T. knighti*, Reynolds Co., Missouri.

Fig. 42. Left lateral view of abdominal segment 7 of female *T. knighti*, Reynolds Co., Missouri.

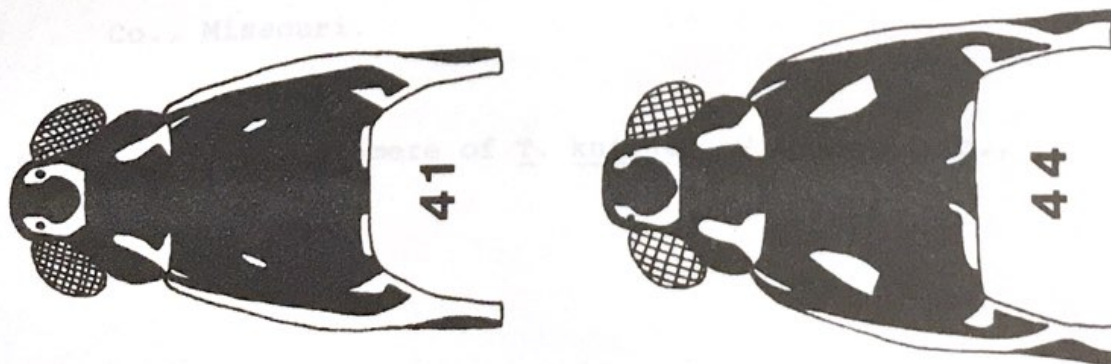


Fig. 44. Dorsal shaft of endosoma of *T. knighti*, Reynolds Co., Missouri.

Fig. 41. Dorsal shaft of endosoma of *T. knighti*, Reynolds Co., Missouri.

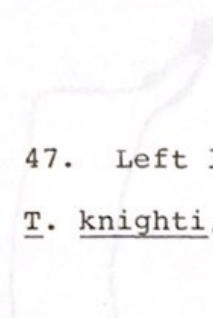


Fig. 47. Left lateral view of abdominal segment 7 of female T. knighti, MacDonald Co., Missouri.

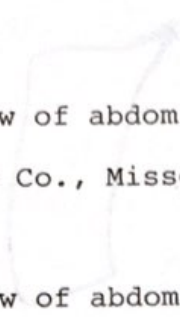


Fig. 48. Left lateral view of abdominal segment 7 of female T. knighti, Scott Co., Illinois.

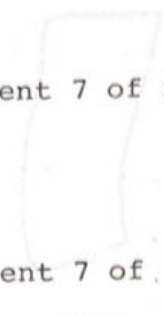


Fig. 49. Left lateral view of abdominal segment 7 of female T. knighti, Iroquois Co., Illinois.

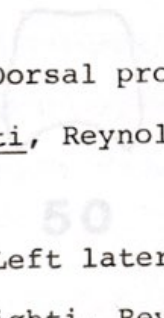


Fig. 50. Dorsal profile of abdominal segment 8 of male T. knighti, Reynolds Co., Missouri.

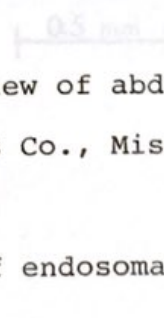


Fig. 51. Left lateral view of abdominal segment 8 of male T. knighti, Reynolds Co., Missouri.

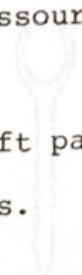


Fig. 52. Dorsal shaft of endosoma of T. knighti, Reynolds Co., Missouri.

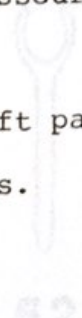


Fig. 53. Left paramere of T. knighti, Washington Co., Arkansas.



47



48



49



50

0.5 mm



51

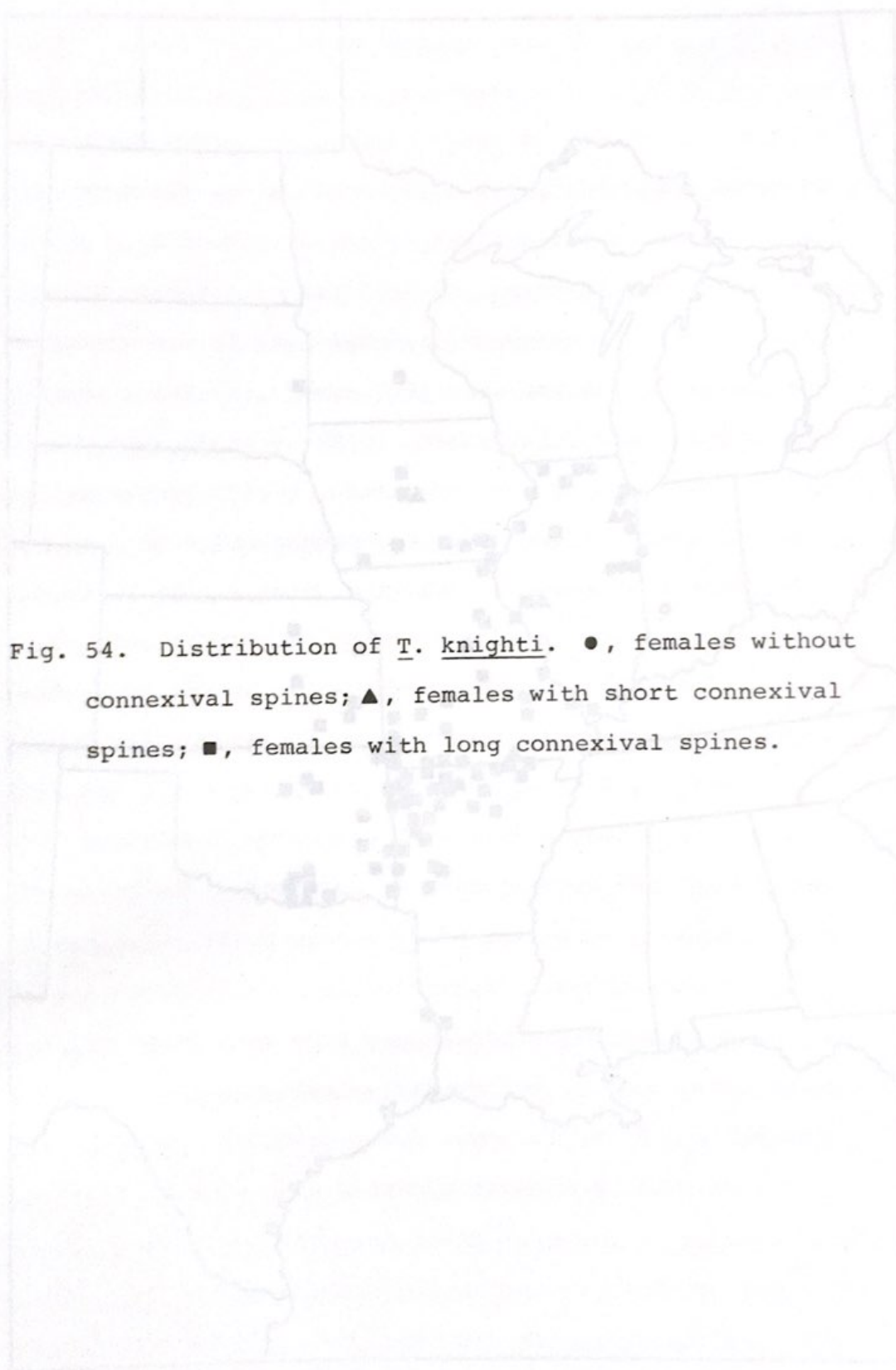


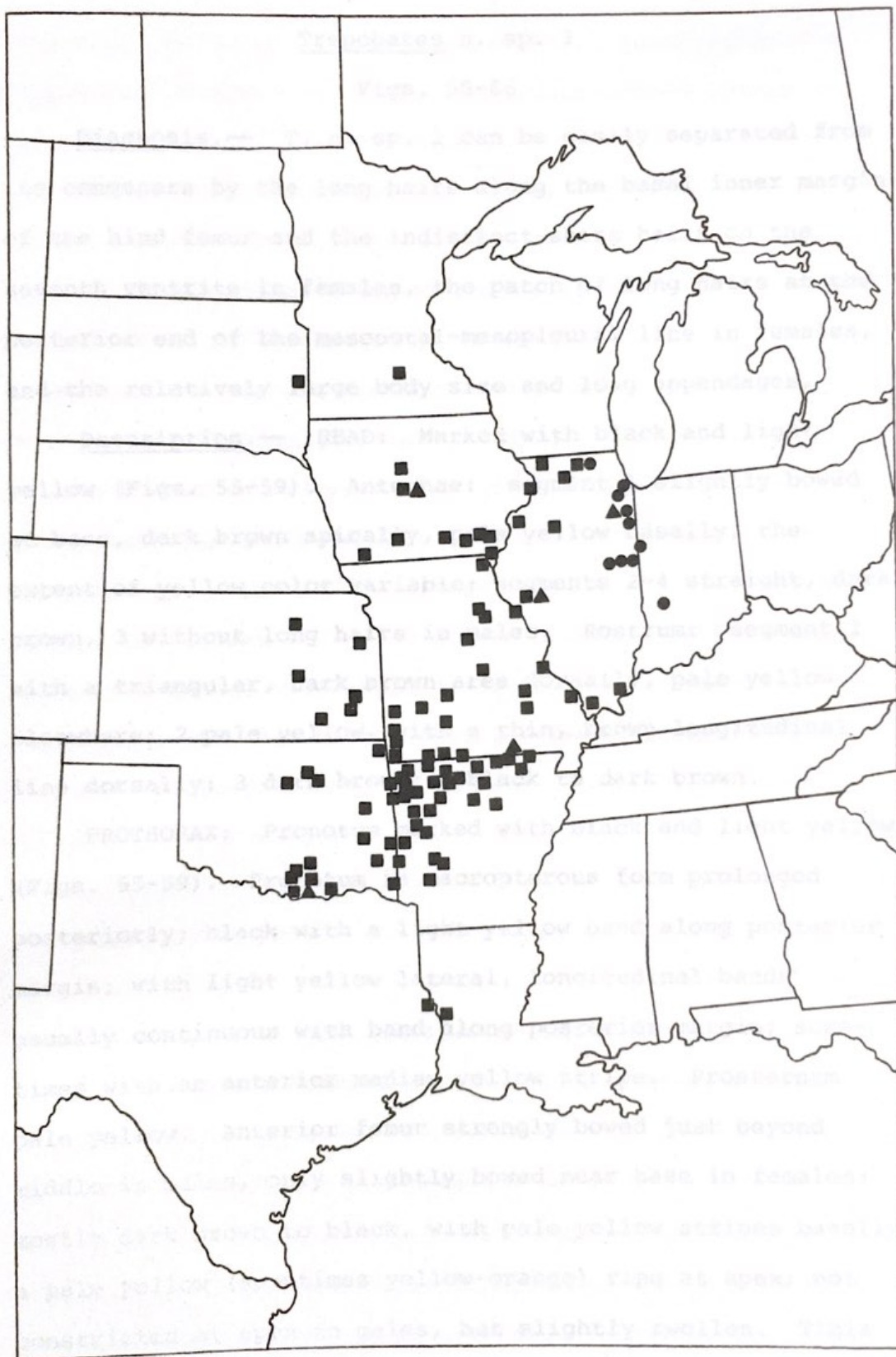
52

0.1 mm



53





Trepobates n. sp. 1

Figs. 55-66

Diagnosis.— T. n. sp. 1 can be easily separated from its congeners by the long hairs along the basal inner margin of the hind femur and the indistinct short hairs on the seventh ventrite in females, the patch of long hairs at the posterior end of the mesonotal-mesopleural line in females, and the relatively large body size and long appendages.

Description.— HEAD: Marked with black and light yellow (Figs. 55-59). Antennae: segment 1 slightly bowed at base, dark brown apically, pale yellow basally, the extent of yellow color variable; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale yellow elsewhere; 2 pale yellow, with a thin, brown longitudinal line dorsally; 3 dark brown; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 55-59). Pronotum in macropterous form prolonged posteriorly; black with a light yellow band along posterior margin; with light yellow lateral, longitudinal bands usually continuous with band along posterior margin; sometimes with an anterior median yellow stripe. Prosternum pale yellow. Anterior femur strongly bowed just beyond middle in males, only slightly bowed near base in females; mostly dark brown to black, with pale yellow stripes basally, a pale yellow (sometimes yellow-orange) ring at apex; not constricted at apex in males, but slightly swollen. Tibia

very slightly bowed in males, straight in females; mostly dark brown to black, with pale yellow or yellow-orange apically. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 55-59), not prolonged posteriorly in females; a patch of long, dark hairs at posterior end of mesonotal-mesopleural line in females (Fig. 60). A light yellow mesopleural spot posterior to black postocular stripe of pronotum absent. Mesosternum pale yellow, black color of mesopleuron extending onto anterior margin. Middle femur with dark brown and pale yellow stripes, males with a thick ventral fringe of long, dark brown hairs; these hairs, at maximum length, approximately 55-75% of the diameter of the femur. Tibia dark brown; males with a single ventral row of hairs along basal one-half which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 85-125% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum black with paired, light yellow spots; rarely with a median patch of long hairs in females. Metasternum pale yellow. Posterior femur dark brown with a light yellow dorsal stripe basally; with a dense fringe of very long hairs along basal inner margin in females (Fig. 61). Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black, some marked with light yellow, especially in females; mostly covered with a gray-blue bloom, more extensive in males. Ventrites

mostly pale yellow with some black along sides, especially in males; ventrite 7 in females with a row of short, mostly light hairs along posterior margin, these hairs not readily visible. Connexival segments light yellow with black margins; lateral margins of segment 5 in males with moderately long, dark hairs; segment 5 and sometimes 4 with long, dark hairs and segments 2 and 3 sometimes with moderately long hairs in females; connexiva in females not produced at apex into long spines.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 62; with very short, thin, pale pubescence ventrally (Fig. 63). Pygophore with very short, pale pubescence posteriorly. Dorsal shaft of endosoma shown in Fig. 64. Paramere as in Fig. 65.

Measurements.— **HEAD:** Transocular width of male 1.02-1.11 mm (1.06), female 1.09-1.17 mm (1.12). Interocular space of male 0.41-0.45 mm (0.43), female 0.45-0.52 mm (0.48). **Antennae:** male— 1) 0.96-1.09 mm (1.05), 2) 0.53-0.60 mm (0.57), 3) 0.60-0.73 mm (0.65), 4) 0.65-0.72 mm (0.69); female— 1) 0.96-1.12 mm (1.03), 2) 0.56-0.65 mm (0.60), 3) 0.64-0.75 mm (0.70), 4) 0.67-0.74 mm (0.70).

PROTHORAX: Pronotum: male— 0.87-0.96 mm (0.92) wide, 0.50-0.60 mm (0.54) long; female— 0.89-1.12 mm (1.00) wide, 0.48-0.57 mm (0.52) long. Anterior femur in male 1.32-1.55 mm (1.46), female 1.40-1.72 mm (1.54). Tibia in male 1.01-1.14 mm (1.08), female 1.02-1.29 mm (1.12). Tarsus 1 in male 0.07-0.10 mm (0.08), female 0.08-0.13 mm

(0.10). Tarsus 2 in male 0.40-0.48 mm (0.44), female 0.43-0.52 mm (0.48).

MESOTHORAX: Mesonotum: male— 1.36-1.52 mm (1.43) wide, 0.97-1.16 mm (1.07) long; female— 1.62-1.98 mm (1.81) wide, 1.19-1.41 mm (1.30) long. Middle femur in male 2.06-2.41 mm (2.20), females 2.32-2.83 mm (2.57). Tibia in male 3.89-4.58 mm (4.12), female 4.46-4.98 mm (4.72). Tarsus 1 in male 1.22-1.49 mm (1.28), female 1.37-1.76 mm (1.57). Tarsus 2 in male 0.98-1.12 mm (1.05), female 1.10-1.31 mm (1.22).

METATHORAX: Posterior femur in male 2.93-3.37 mm (3.11), female 3.29-3.91 mm (3.55). Tibia in male 1.42-1.69 mm (1.55), female 1.66-1.96 mm (1.76). Tarsus 1 in male 0.59-0.79 mm (0.68), female 0.71-0.86 mm (0.78). Tarsus 2 in male 0.33-0.43 mm (0.39), female 0.40-0.46 mm (0.44).

SIZE: Length— male 3.61-4.11 mm (3.87), female 4.16-4.80 mm (4.46). Width— male 1.36-1.52 mm (1.43), female 1.62-1.98 mm (1.81).

Taxonomy.— This species can be identified by the patch of long hairs at the posterior end of the mesonotal-mesopleural line in females, the long hairs along the basal inner margin of the hind femur in females, and the relatively large body size and long appendages.

Intraspecific Variation.— *T. n. sp. 1* is somewhat variable in color pattern (Figs. 55-59). Metanotal hairs may be present or absent in females. The macropterous form

apparently is uncommon and represented 14% of all specimens examined.

Natural History.— Very little is known about the natural history of T. n. sp. 1. It has been collected only from lotic habitats, including creeks, rivers, and a large spring. Records are given below for each month from February through July, and September through November. The life history of T. n. sp. 1 has not been studied.

Distribution.— This water strider has been collected in five states and Distrito Federal of Mexico (Fig. 66).

Material Examined.— MEXICO: Distrito Federal: Mexico City, July 7, 1937, 4m (UKL). Guerrero: La Sabana, Oct. 20, 1936, 1m, 1lf (UKL); stream, 40 mi. N of Acapulco, April 26, 1964, 1m, 2f (JTP). Morelos: Acatlipa, May 5, 1944, 1f (UKL); stream, 20 mi. S of Cuernavaca, April 27, 1964, 7m, 6f (JTP); stream, 5 mi. W of Zacatepec, April 25, 1964, 2m, 2f (JTP); river, 4 mi. N of Amacuzac, April 25, 1964, 2m, 3f (JTP); river, 8 mi. E of Zacatepec, April 25, 1964, 1m (JTP); stream, 2 mi. S of Cuautla, April 25, 1964, 21m, 28f (JTP); Mazatepec, April 29, 1944, 11m, 10f (UKL). Nayarit: river, Santa Cruz, June 8, 1975, 1m, 1f (JTP); stream, 5 mi. E of Tuxpan, April 21, 1964, 11m, 12f (JTP); 23 mi. NW of Tepic, Sept. 10, 1972, 1m, 1f (USU); stream, 15 mi. E of San Blas, April 21, 1964, 2m (JTP); jungle river, San Blas, June 7, 1966, 1m, 1f, Nov. 28, 1968, 1m (JTP); San Blas, Sept. 17-21, 1953, 1f (JTP); large spring, San Blas, June 3, 1966, 1f (JTP). Sinaloa: Rio Presidio,

Villa Union Presidio, July 21, 1952, 1m, 1f (JTP); Arroyo Sonolona, 18.5 mi. E of Culiacan, April 2, 1955, 7m, 11f (UMAA); Los Mayos, July 24, 1952, 5m, 11f (JTP). Sonora: Arroyo Cuchujaqui, 9 mi. E of Alamos, Feb. 17, 1957, 1m, 1f (UMAA); Rio Cuchujaqui, 5 mi. E of Alamos, June 11, 1974, 2m (PDK); Arroyo El Cajou, Cajou, Feb. 16, 1957, 2f (UMAA); Arroyo Cuchujaqui, Alamos, March 21, 1967, 1m (JTP); Arroyo Cuchujaqui, 5 mi. ESE of Alamos, May 29, 1966, 3m, 2f (JTP).

Fig. 36. Color pattern of male *T. n. sp. 1*, Morelos,

Mexico.

Fig. 37. Color pattern of female *T. n. sp. 1*, Morelos,

Mexico.

Fig. 38. Color pattern of female *T. n. sp. 1*, Nayarit,

Mexico.

Fig. 39. Color pattern of female *T. n. sp. 1*, Sinaloa,

Mexico.



Fig. 55. Color pattern of male T. n. sp. 1, Nayarit, Mexico.

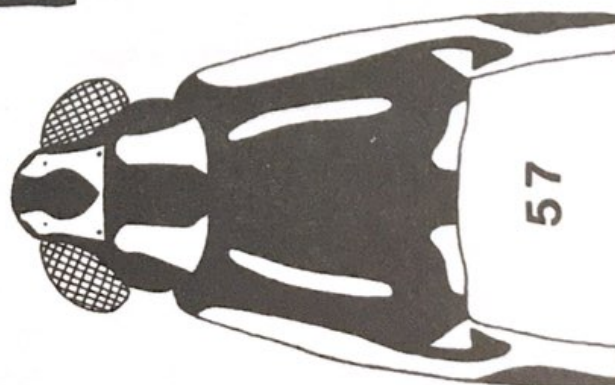
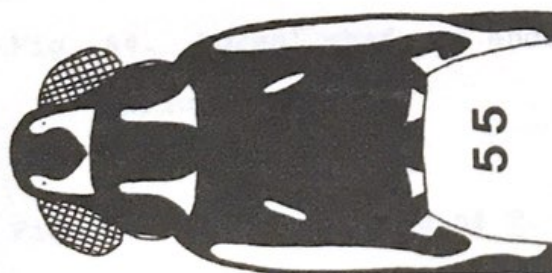
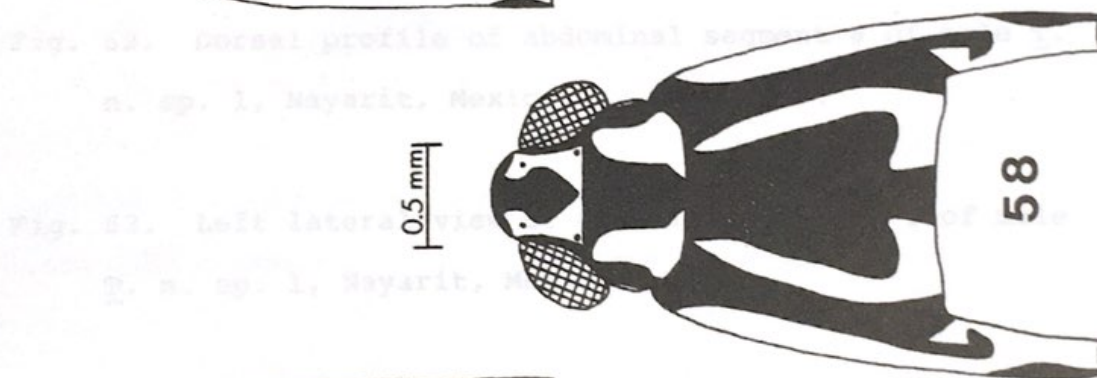
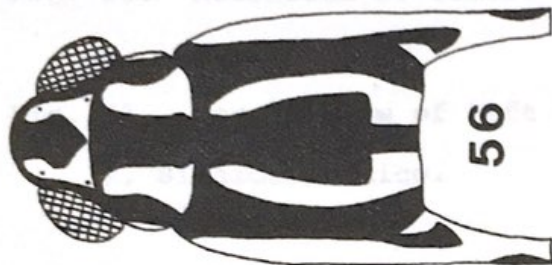
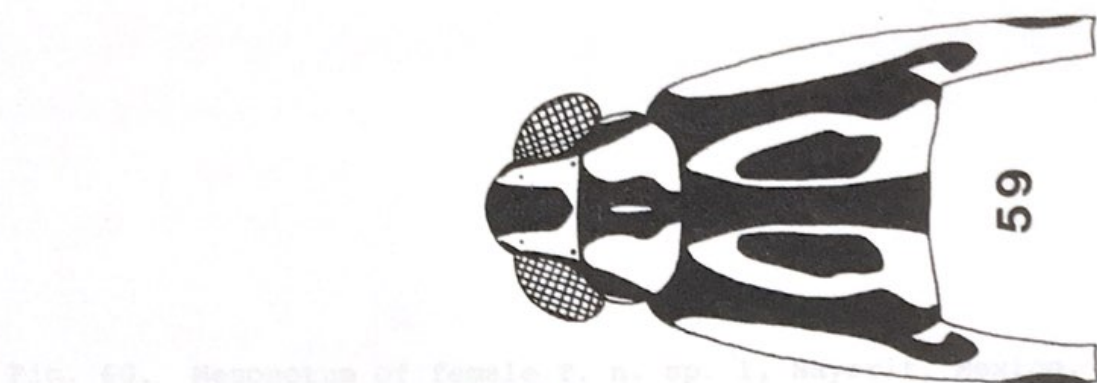
Fig. 56. Color pattern of male T. n. sp. 1, Morelos, Mexico.

Fig. 57. Color pattern of female T. n. sp. 1, Morelos, Mexico.

Fig. 58. Color pattern of female T. n. sp. 1, Nayarit, Mexico.

Fig. 59. Color pattern of female T. n. sp. 1, Sinaloa, Mexico.





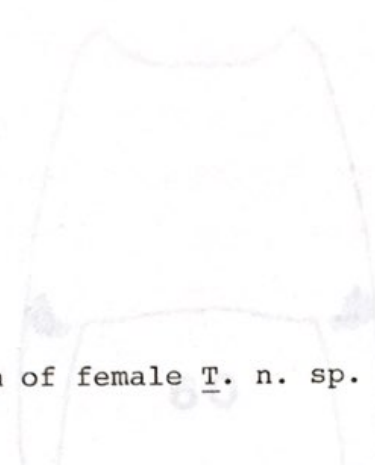


Fig. 60. Mesonotum of female T. n. sp. 1, Nayarit, Mexico.

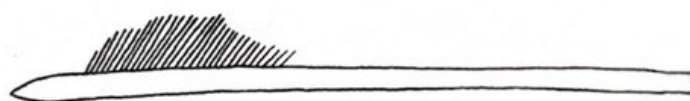
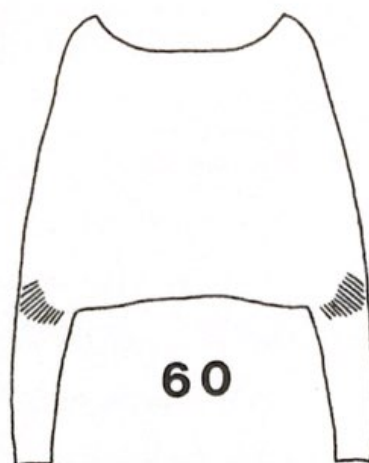
Fig. 61. Dorsal view of left hind femur of female T. n. sp. 1, Sinaloa, Mexico.

Fig. 62. Dorsal profile of abdominal segment 8 of male T. n. sp. 1, Nayarit, Mexico.

Fig. 63. Left lateral view of abdominal segment 8 of male T. n. sp. 1, Nayarit, Mexico.

Fig. 64. Dorsal shaft of endosoma of T. n. sp. 1, Nayarit, Mexico.

Fig. 65. Left paramere of T. n. sp. 1, Sinaloa, Mexico.



61

0.5 mm

Fig. 55. Distribution of 1.



62

0.5 mm



63



64

0.1 mm



65

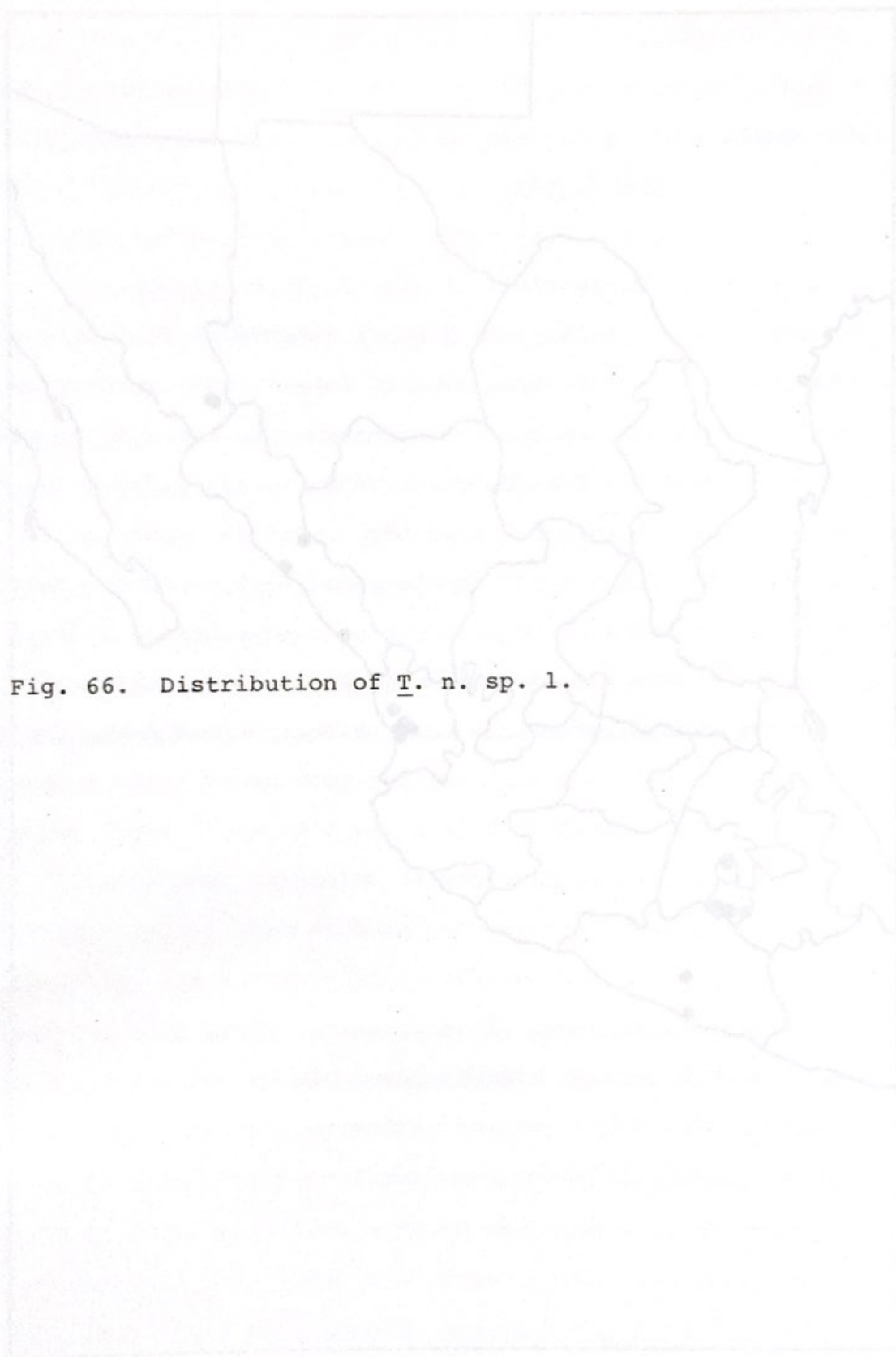
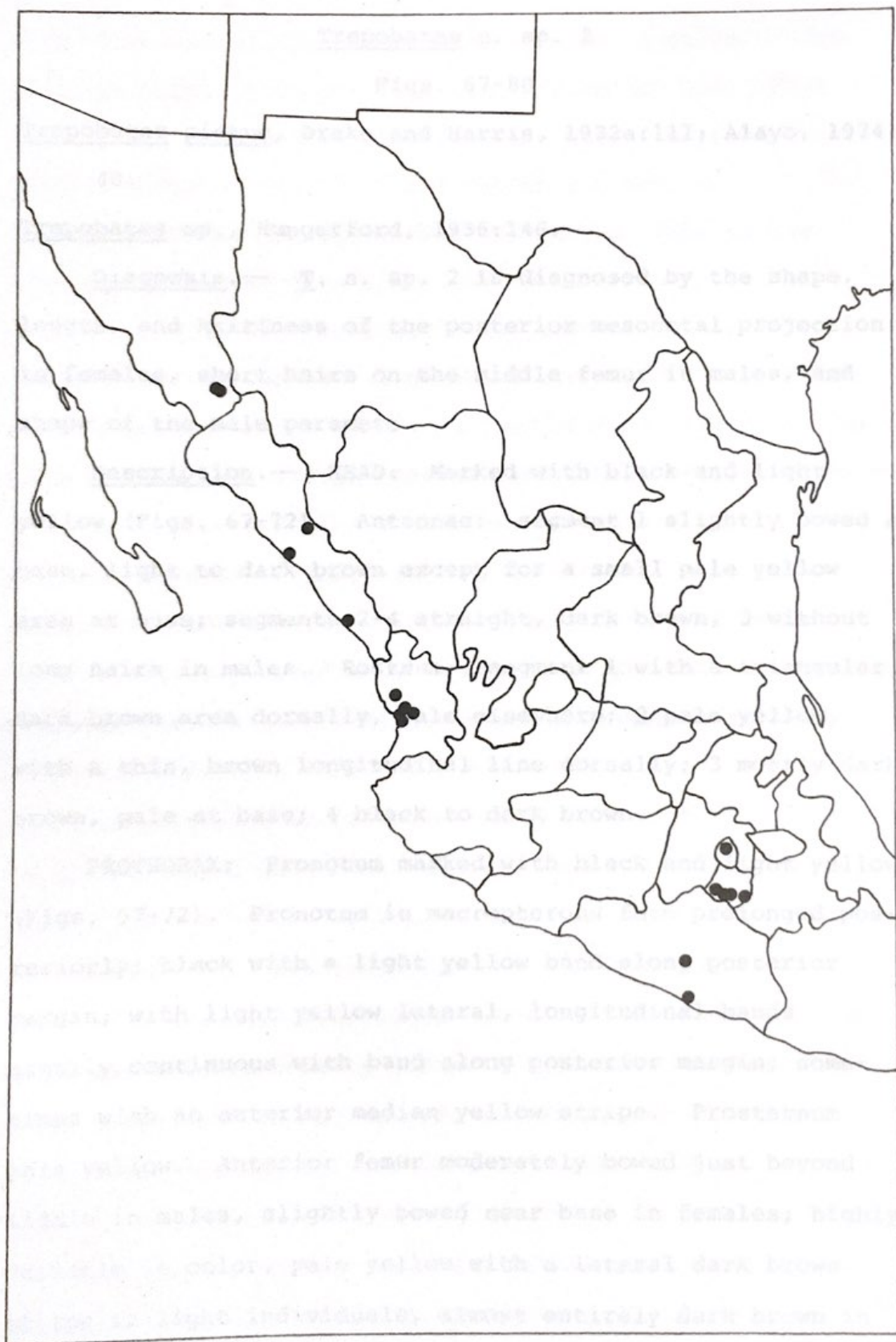


Fig. 66. Distribution of *T. n. sp. 1*.



Trepobates n. sp. 2

Figs. 67-80

Trepobates pictus, Drake and Harris, 1932a:111; Alayo, 1974: 48.

Trepobates sp., Hungerford, 1936:146.

Diagnosis.— T. n. sp. 2 is diagnosed by the shape, length, and hairiness of the posterior mesonotal projection in females, short hairs on the middle femur in males, and shape of the male paramere.

Description.— HEAD: Marked with black and light yellow (Figs. 67-72). Antennae: segment 1 slightly bowed at base, light to dark brown except for a small pale yellow area at base; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 pale yellow, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 67-72). Pronotum in macropterous form prolonged posteriorly; black with a light yellow band along posterior margin; with light yellow lateral, longitudinal bands usually continuous with band along posterior margin; sometimes with an anterior median yellow stripe. Prosternum pale yellow. Anterior femur moderately bowed just beyond middle in males, slightly bowed near base in females; highly variable in color, pale yellow with a lateral dark brown stripe in light individuals, almost entirely dark brown in

dark individuals; not constricted at apex in males. Tibia slightly bowed in males, straight in females; dark brown basally and pale yellow apically, the extent of yellow color highly variable. Tarsus 1 and tarsus 2 black.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 67-72); prolonged posteriorly in females, this projection with long hairs and somewhat variable in shape (Figs. 73 and 74); a patch of very short, dark hairs usually present along median portion of mesonotal-mesopleural line in females. A light yellow mesopleural stripe posterior to black postocular stripe of pronotum present (Fig. 68). Mesosternum pale yellow, black or dark brown color of mesopleuron extending onto anterior margin; a pair of small, oval, widely separated brown spots often present posteriorly, especially in females. Middle femur with dark brown and pale yellow stripes in light individuals, almost entirely dark brown in dark individuals; males with a thick ventral fringe of short, dark brown hairs; these hairs, at maximum length, approximately 20-40% of the diameter of the femur. Tibia pale yellow basally, dark brown to black apically; males with a single ventral row of short hairs along basal one-third which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 40% of the diameter of the tibia. Tarsus 1 and tarsus 2 black to dark brown.

METATHORAX: Metanotum black with paired, light yellow markings; without a median patch of hairs in females.

Metasternum pale yellow. Posterior femur pale yellow to dark brown, without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 black to dark brown.

ABDOMEN: Abdominal tergites mostly black, some marked with light yellow, especially in females; almost entirely black in dark individuals; some gray-blue bloom present, especially in males. Ventrites mostly pale yellow, dark brown along anterior margins and laterally in some individuals; ventrite 7 in females with a row of moderately long, dark brown hairs along posterior margin, this row interrupted at middle (Fig. 75). Connexival segments mostly light yellow with black anterior margins; lateral margins of segments 5 and 6 in males and 5-7 in females with moderately long, dark hairs; with moderately long, dark hairs at apex in females; connexiva very slightly produced but without long spines in females.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 76; with scattered, short, brown hairs ventrally (Fig. 77). Pygophore with several long, brown hairs at middle; short, pale pubescence posteriorly. Dorsal shaft of endosoma as in Fig. 78. Paramere sharply pointed at apex (Fig. 79).

Measurements.— HEAD: Transocular width of male 0.92-1.00 mm (0.95), female 0.89-1.01 mm (0.96). Interocular space of male 0.33-0.38 mm (0.36), female 0.36-0.41 mm (0.38). Antennae: male— 1) 0.76-0.99 mm (0.90), 2) 0.40-0.53 mm (0.46), 3) 0.40-0.55 mm (0.48), 4) 0.51-0.61 mm

(0.56); female— 1) 0.63-0.84 mm (0.75), 2) 0.36-0.50 mm (0.44), 3) 0.43-0.56 mm (0.51), 4) 0.53-0.64 mm (0.57).

PROTHORAX: Pronotum: male— 0.74-0.86 mm (0.80) wide, 0.38-0.49 mm (0.43) long; female— 0.73-0.88 mm (0.79) wide, 0.33-0.38 mm (0.36) long. Anterior femur in male 1.19-1.46 mm (1.32), female 0.99-1.27 mm (1.16). Tibia in male 0.83-1.04 mm (0.95), female 0.79-0.99 mm (0.89). Tarsus 1 in male 0.06-0.10 mm (0.07), female 0.07-0.10 mm (0.08). Tarsus 2 in male 0.30-0.44 mm (0.37), female 0.34-0.43 mm (0.37).

MESOTHORAX: Mesonotum: male— 1.22-1.45 mm (1.31) wide, 0.82-1.01 mm (0.93) long; female— 1.53-1.94 mm (1.68) wide, 1.08-1.29 mm (1.19) long. Middle femur in male 1.45-1.88 mm (1.67), female 1.59-1.95 mm (1.71). Tibia in male 2.71-3.76 mm (3.26), female 2.85-3.59 mm (3.18). Tarsus 1 in male 0.89-1.12 mm (1.00), female 0.99-1.19 mm (1.07). Tarsus 2 in male 0.74-0.97 mm (0.82), female 0.82-0.98 mm (0.89).

METATHORAX: Posterior femur in male 1.92-2.60 mm (2.23), female 1.97-2.48 mm (2.23). Tibia in male 1.04-1.28 mm (1.16), female 1.06-1.33 mm (1.18). Tarsus 1 in male 0.43-0.56 mm (0.49), female 0.46-0.60 mm (0.51). Tarsus 2 in male 0.26-0.33 mm (0.29), female 0.27-0.36 mm (0.30).

SIZE: Length— male 3.09-3.66 mm (3.43), female 3.27-4.11 mm (3.61). Width— male 1.22-1.45 mm (1.31), female 1.53-1.94 mm (1.68).

Taxonomy.— The records of T. pictus from Cuba (Alayo, 1974) and Jamaica (Drake and Harris, 1932a) are based upon misidentifications of this species. T. n. sp. 2 can be separated from all other species of Trepobates except T. pictus by the presence of a posterior mesonotal projection in females. This species is very similar to T. pictus but differs from it in the following ways: (1) a more tumid, shorter, and hairier posterior mesonotal projection in females; (2) a shorter first antennal segment, especially in males; (3) a slightly different color pattern; and (4) a differently shaped paramere.

Intraspecific Variation.— The color pattern of T. n. sp. 2 is highly variable (Figs. 67-72), and individuals examined from Yucatan, Mexico, are almost entirely dark dorsally. The posterior mesonotal projection in females is somewhat variable in length, tumidity, and hairiness (Figs. 73 and 74), and Yucatan specimens have the most tumid and hairy projections. Hairs along the median portion of the mesonotal-mesopleural line in females usually are present but are absent in some individuals. Brown mesosternal spots were often present, especially in females and darker specimens. Thirty-seven percent of the specimens examined were macropterous.

Natural History.— Little is known about the natural history of T. n. sp. 2. It has been taken from both lentic and lotic habitats, including creeks, rivers, ponds, borrow pits, and cenotes. I collected T. n. sp. 2 in association

with T. subnitidus and Rheumatobates hungerfordi in Texas. Collection records are given below for January through April, June through August, November, and December. The life history of this species has not been investigated.

Distribution.— T. n. sp. 2 has been collected in southern Texas, Mexico, Belize, Guatemala, Cuba, Honduras, and Jamaica (Fig. 80).

Material Examined.— BELIZE: Beaver Dam Cr., 15 mi. E of Roaring Cr., Dec. 27, 1973, 1m, 2f (JTP).

CUBA: Consolacion del Sur, April 16, 1930, 1m, 1f (NN); Santiago de las Vegas, Nov. 13, 1922, 1f (UKL).

GUATEMALA: pond, 3 mi. S of Tikal, Jan. 2, 1973, 4m, 5f (JTP).

HONDURAS: Tela, March 15, 1936, 16m, 31f (UKL).

JAMAICA: Port Antonio, 1f (AMNH); pond, St. Ann, Feb., 1928, 1f (UKL).

MEXICO: Campeche: Champoton Janataya, July 9, 1932, 1f (USNM). Nuevo Leon: Rio Cabezano, 17 mi. N. of Linares, Dec. 14, 1969, 1m (JTP). San Luis Potosi: 3 mi. W of El Naranjo, June 5, 1965, 1m, 1f (JCS); stream, El Salto, Dec. 14, 1969, 2f (JTP). Veracruz: jungle stream, 3 mi. W of Conejos, Jan. 6, 1971, 4m (JTP); borrow pit, 14 mi. N of Nautla, Jan. 7, 1971, 1f (JTP); stream, 17 mi. S of Tuxpan, Jan. 7, 1971, 2m (JTP); spring-fed stream, 19 mi. N of Conejos, Jan. 6, 1971, 2m (JTP); stream, S of Gutierrez Zamora, Jan. 7, 1971, 1m, 2f (JTP); 3 mi. W of Paso de Ovejas, Aug. 17, 1959, 1f (USNM); 15.8 mi. S of Tampico,

April 19, 1974, 4m, 10f (TAMU); 16 mi. S of La Tinaja, Jan. 4, 1971, 3f (JTP); jungle stream, 19 mi. SE of Tantoyuca, Jan. 8, 1971, 7m, 8f (JTP). Yucatan: Uki Cenote, Motul, July 26, 1932, 3f (USNM), 3f (UMAA); Manzanilla Cenote, Merida, July 23, 1932, 5f (UMAA), 1f (UKL); Carlos Morales Escuela Cenote, Merida, July 23, 1932, 1m (USNM), 2m, 2f (UKL); Chapultapec Cenote, Merida, July 20, 1932, 4f (UMAA), 1f (USNM), 1f (UKL); Geiser Cenote, Merida, July 19, 1932, 2m, 3f (UMAA), 1m (USNM); Huntun Cenote, Piste, June 19-20, 1932, 4f (UMAA), 2f (USNM), 1m, 1f (UKL); Choch Cenote, Piste, June 21, 1932, 1m, 2f (UMAA), 1f (USNM), 1m, 1f (UKL); Ciruak Cenote, Piste, June 22, 1932, 4f (UMAA), 3f (USNM), 1f (UKL); Ixil Cenote, Chichen Itza, June 15, 1932, 1m (UMAA), 1f (UKL); Xanaba Cenote, Chichen Itza, June 25, 1932, 2f (UMAA); Xcan Yui Cenote, Chichen Itza, June 16-17, 1932, 7f (UMAA), 3f (USNM), 1m (UKL).

UNITED STATES: Texas: La Salle Co.: Nueces R., 1 mi. S of Cotulla, June 13, 1976, 1m, 1f (PDK). Starr Co.: Arroyo Salado, 14 mi. E of Rio Grande City, June 11, 1975, 2m, 1f (UG). Zapata Co.: pond, Zapata, June 13, 1976, 2f (PDK).

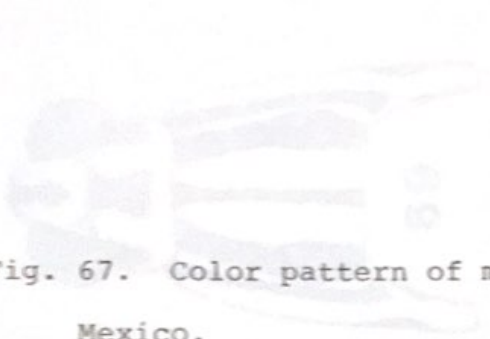


Fig. 67. Color pattern of male T. n. sp. 2, Veracruz, Mexico.

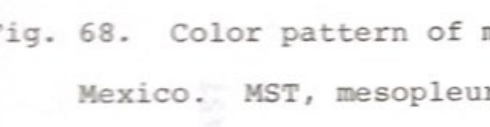


Fig. 68. Color pattern of male T. n. sp. 2, Veracruz, Mexico. MST, mesopleural stripe.

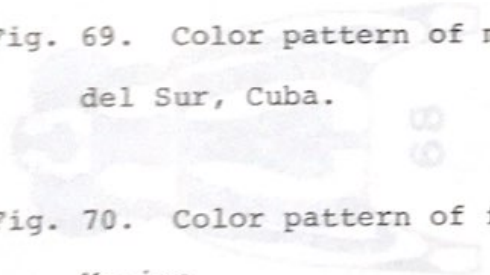


Fig. 69. Color pattern of male T. n. sp. 2, Consolacion del Sur, Cuba.

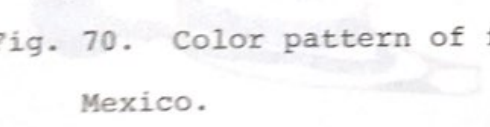


Fig. 70. Color pattern of female T. n. sp. 2, Veracruz, Mexico.

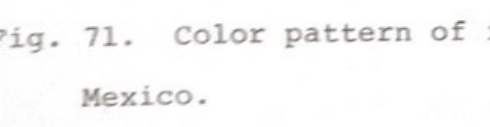


Fig. 71. Color pattern of female T. n. sp. 2, Veracruz, Mexico.

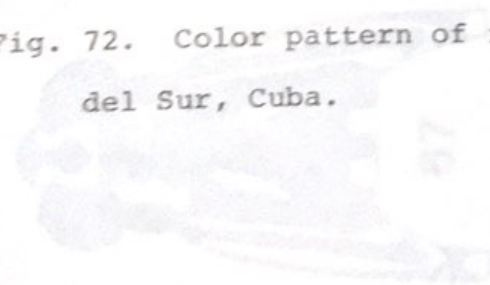


Fig. 72. Color pattern of female T. n. sp. 2, Consolacion del Sur, Cuba.

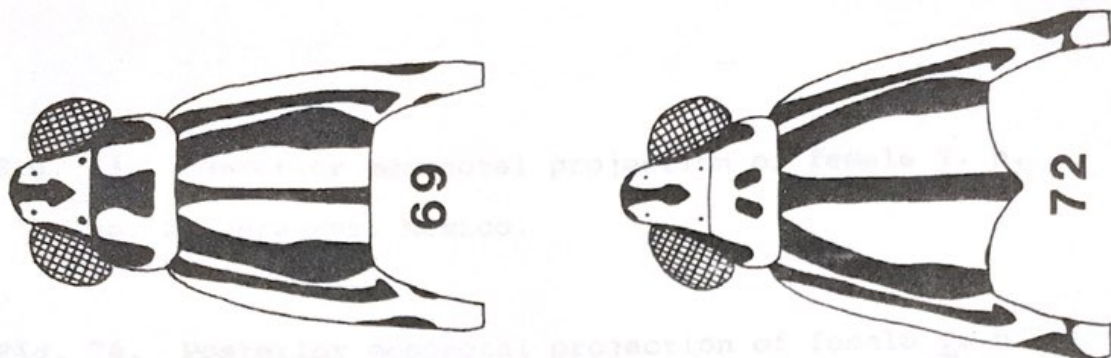


Fig. 72. Posterior abdominal projection of female *T. n. sp. 2*, Zacán, Guatemala.

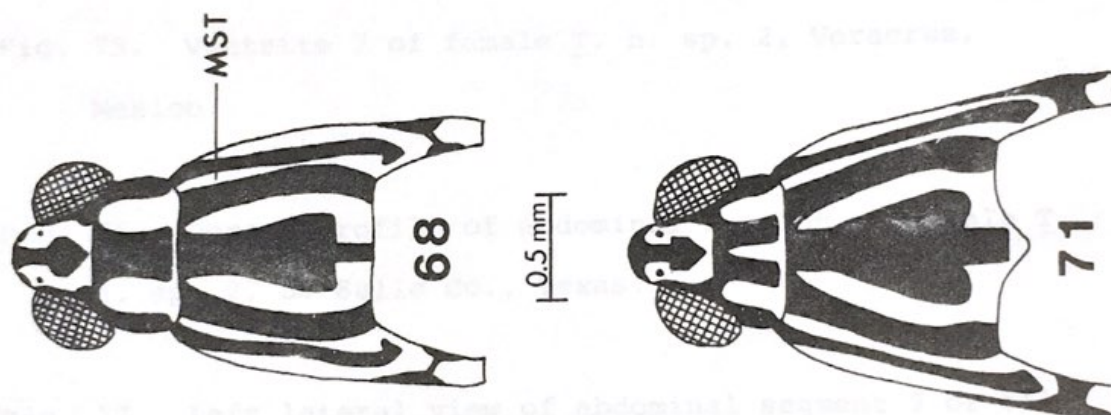


Fig. 73. Left lateral view of female *T. n. sp. 1*, Veracruz.

Fig. 74. Left lateral view of abdominal segments 9 and 10 of female *T. n. sp. 2*, La Salle Co., Texas.

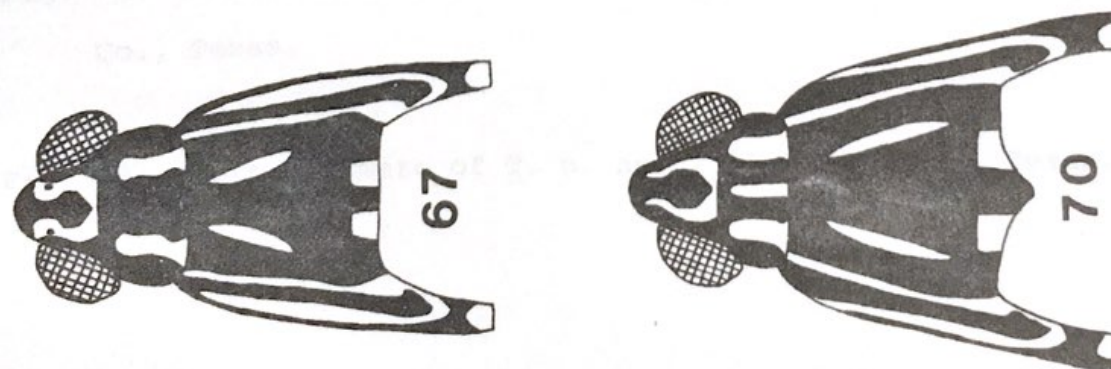


Fig. 75. Dorsal view of endosoma of *T. n. sp. 2*, La Salle Co., Texas.

Fig. 73. Posterior mesonotal projection of female T. n.
sp. 2, Veracruz, Mexico.

Fig. 74. Posterior mesonotal projection of female T. n.
sp. 2, Peten, Guatemala.

Fig. 75. Ventrite 7 of female T. n. sp. 2, Veracruz,
Mexico.

Fig. 76. Dorsal profile of abdominal segment 8 of male T.
n. sp. 2, La Salle Co., Texas.

Fig. 77. Left lateral view of abdominal segment 8 of male
T. n. sp. 2, La Salle Co., Texas.

Fig. 78. Dorsal shaft of endosoma of T. n. sp. 2, La Salle
Co., Texas.

Fig. 79. Left paramere of T. n. sp. 2, La Salle Co., Texas.



73



74

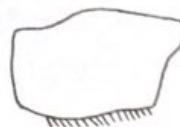


75



76

0.5 mm



77



78

0.1 mm



79

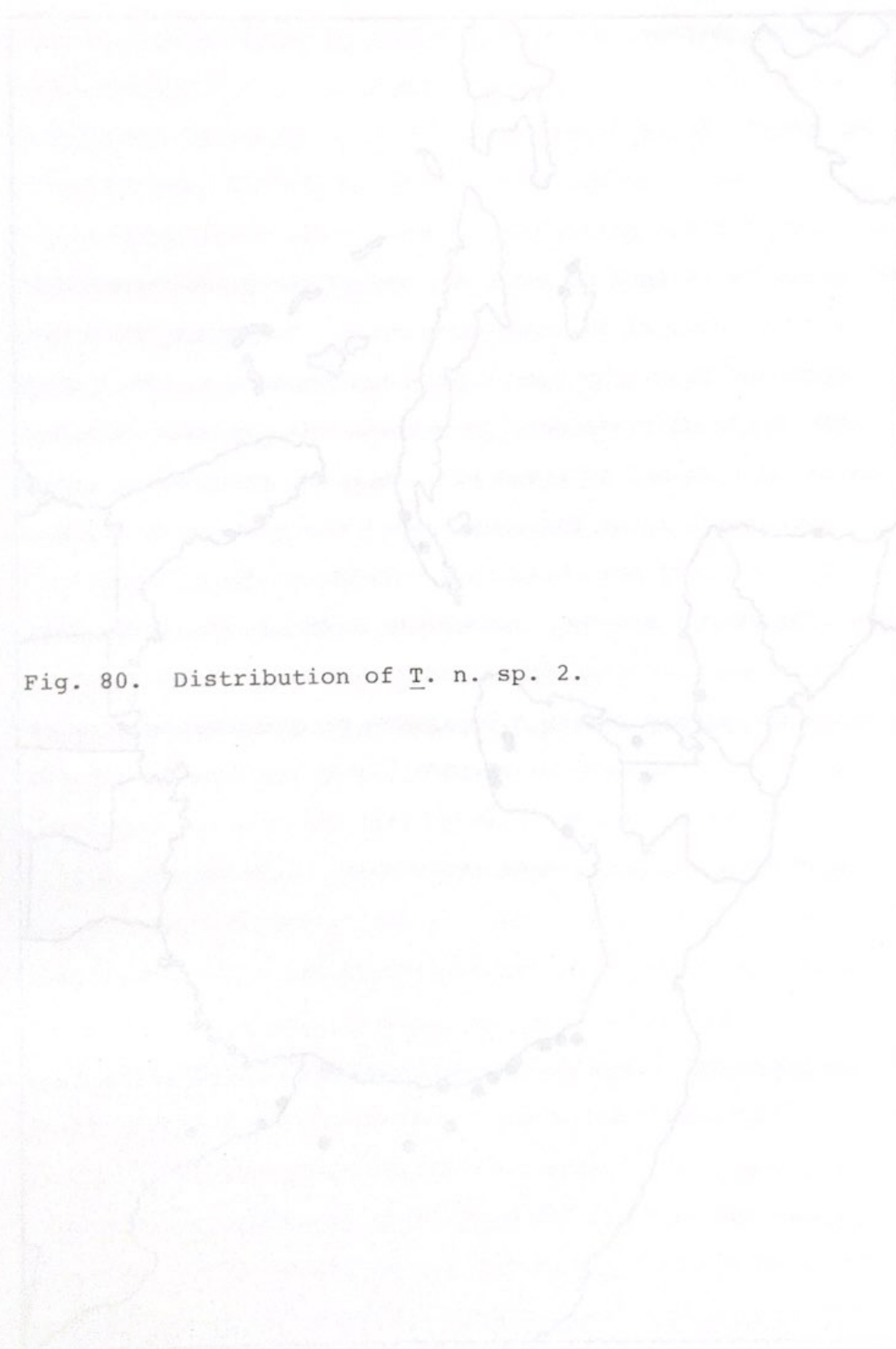
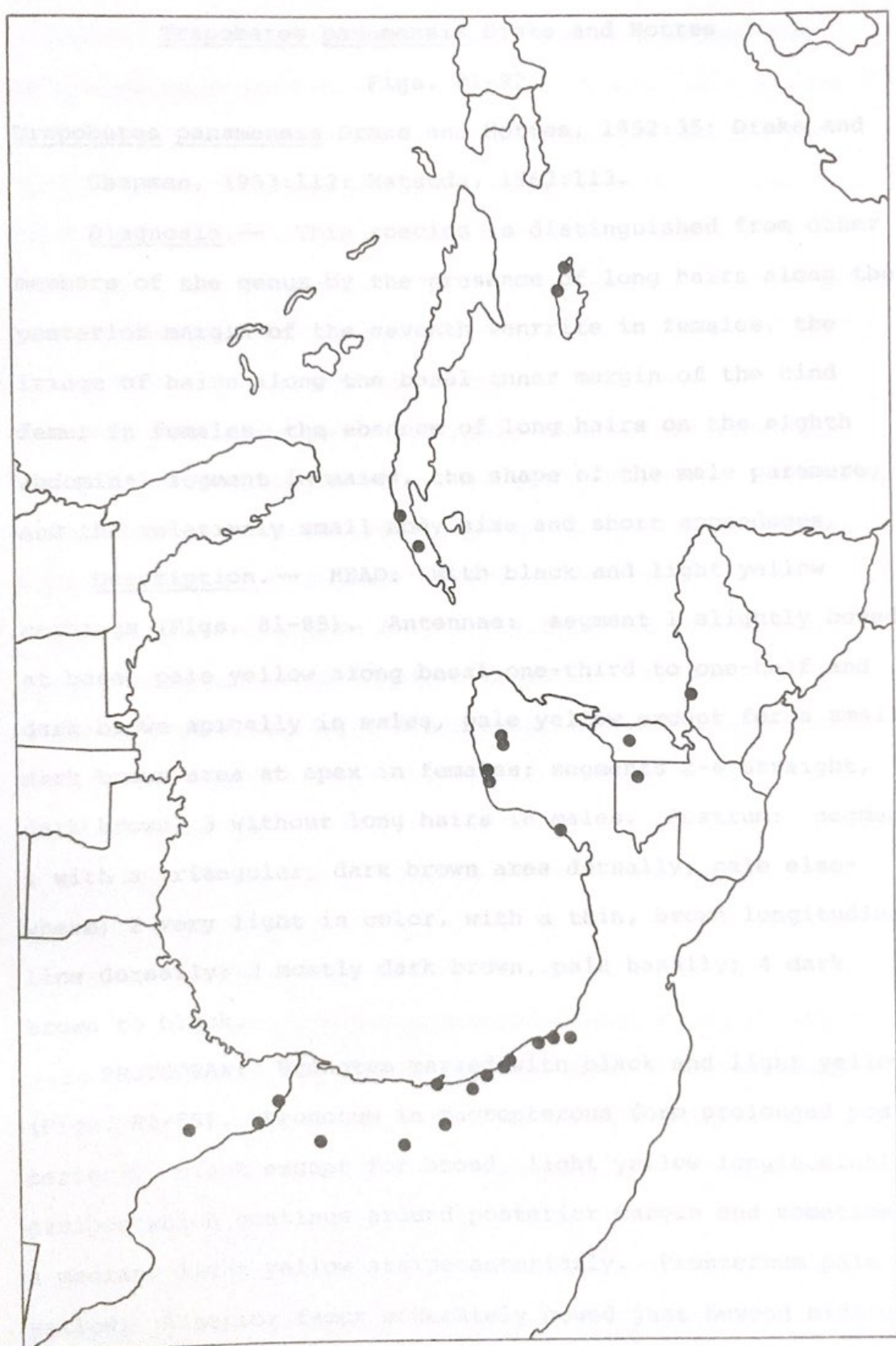


Fig. 80. Distribution of T. n. sp. 2.



Trepobates panamensis Drake and Hottes

Figs. 81-92

Trepobates panamensis Drake and Hottes, 1952:35; Drake and Chapman, 1953:112; Matsuda, 1962:113.

Diagnosis.— This species is distinguished from other members of the genus by the presence of long hairs along the posterior margin of the seventh ventrite in females, the fringe of hairs along the basal inner margin of the hind femur in females, the absence of long hairs on the eighth abdominal segment in males, the shape of the male paramere, and the relatively small body size and short appendages.

Description.— **HEAD:** With black and light yellow markings (Figs. 81-85). **Antennae:** segment 1 slightly bowed at base, pale yellow along basal one-third to one-half and dark brown apically in males, pale yellow except for a small dark brown area at apex in females; segments 2-4 straight, dark brown, 3 without long hairs in males. **Rostrum:** segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 very light in color, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, pale basally; 4 dark brown to black.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 81-85). Pronotum in macropterous form prolonged posteriorly, black except for broad, light yellow longitudinal stripes which continue around posterior margin and sometimes a median, light yellow stripe anteriorly. Prosternum pale yellow. Anterior femur moderately bowed just beyond middle

in males, very slightly bowed near base in females; mostly dark brown with pale yellow at base in males, pale yellow more extensive in females, both sexes with a pale yellow ring at apex; not constricted at apex in males. Tibia slightly bowed in males, straight in females; mostly dark brown in males, mostly pale yellow in females. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 81-85), very rarely slightly produced posteriorly in females; a very small patch of short, dark hairs along median portion of mesonotal-mesopleural line in females; a small patch of short, dark hairs often present along median posterior margin in females. A small, light yellow mesopleural spot posterior to black postocular stripe of pronotum often present (Fig. 82). Black color of mesopleuron sometimes extending onto anterior margin of mesosternum, remainder of mesosternum pale yellow. Middle femur with dark brown and pale yellow longitudinal stripes, males with a thick ventral fringe of short, dark brown hairs; these hairs, at maximum length, approximately 30-50% of the diameter of the femur. Tibia dark brown; males with a single ventral row of short hairs along basal one-fourth which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 30% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum mostly black with paired, light yellow markings, without a median patch of long hairs in

females. Metasternum pale yellow. Posterior femur mostly dark brown but sometimes with a pale yellow dorsal stripe; with a dense fringe of long hairs along basal inner margin in females (Fig. 86). Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites almost entirely black and mostly covered with a gray-blue bloom in males; tergites with more extensive light yellow markings and only a small amount of gray-blue bloom in females. Ventrites mostly pale yellow but some black laterally, especially in males; ventrite 7 in females with a row of long, dark brown hairs along posterior margin (Fig. 87), this row not distinctly interrupted at middle. Connexival segments mostly light yellow, with black anterior margins; lateral margins of segments 5 and 6 in males and segments 3-7 in females with moderately long, dark hairs; connexiva in females not produced into spines at apex.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 88; with short, thin, pale pubescence ventrally (Fig. 89). Pygophore with short, thin, brown pubescence at middle and posteriorly. Dorsal shaft of endosoma shown in Fig. 90. Paramere large, broad at middle, and sharply pointed at apex (Fig. 91).

Measurements.— HEAD: Transocular width of male 0.89-0.96 mm (0.93), female 0.89-1.01 mm (0.96). Interocular space of male 0.33-0.37 mm (0.35), female 0.36-0.40 mm (0.38). Antennae: male— 1) 0.73-0.83 mm (0.75), 2) 0.41-

0.48 mm (0.45), 3) 0.43-0.52 mm (0.46), 4) 0.46-0.54 mm (0.52); female— 1) 0.65-0.73 mm (0.68), 2) 0.40-0.46 mm (0.43), 3) 0.41-0.52 mm (0.48), 4) 0.50-0.57 mm (0.53).

PROTHORAX: Pronotum: male— 0.79-0.88 mm (0.83) wide, 0.39-0.46 mm (0.44) long; female— 0.76-0.86 mm (0.83) wide, 0.33-0.42 mm (0.38) long. Anterior femur in male 1.23-1.32 mm (1.28), female 1.06-1.24 mm (1.15). Tibia in male 0.87-1.02 mm (0.93), female 0.79-0.93 mm (0.87). Tarsus 1 in male 0.06-0.08 mm (0.07), female 0.05-0.09 mm (0.07). Tarsus 2 in male 0.32-0.40 mm (0.36), female 0.32-0.41 mm (0.36).

MESOTHORAX: Mesonotum: male— 1.26-1.45 mm (1.35) wide, 0.86-0.96 mm (0.91) long; female— 1.48-1.90 mm (1.69) wide, 0.93-1.24 mm (1.06) long. Middle femur in male 1.30-1.63 mm (1.53), female 1.52-1.78 mm (1.64). Tibia in male 2.46-3.06 mm (2.83), female 2.78-3.51 mm (3.08). Tarsus 1 in male 0.86-1.02 mm (0.94), female 0.96-1.22 mm (1.08). Tarsus 2 in male 0.64-0.86 mm (0.76), female 0.76-0.98 mm (0.88).

METATHORAX: Posterior femur in male 1.89-2.27 mm (2.08), female 1.95-2.45 mm (2.17). Tibia in male 1.00-1.17 mm (1.10), female 1.02-1.32 mm (1.17). Tarsus 1 in male 0.42-0.51 mm (0.46), female 0.43-0.60 mm (0.52). Tarsus 2 in male 0.26-0.32 mm (0.29), female 0.30-0.33 mm (0.32).

SIZE: Length— male 3.09-3.56 mm (3.37), female 3.11-3.86 mm (3.51). Width— male 1.26-1.45 mm (1.35), female 1.48-1.90 mm (1.69).

Type Data.— The male holotype from the Canal Zone, Panama, is in the Drake Collection, U.S. National Museum, and was studied during this investigation. This specimen was collected from a small stream, February 2-10, 1939, by Carl J. Drake. Male and female paratypes in the Drake Collection from Panama and Oaxaca, Mexico, also were examined.

Taxonomy.— T. panamensis has not been confused with other species in the past and can be identified by the characters given in the description and keys. This species is most similar to T. becki but has the following characters which separate it from that species: (1) a much broader male paramere; (2) shorter appendages and smaller body size; (3) shorter hairs on the middle femur in males; (4) absence of connexival spines and metanotal hairs in females; (5) hairs along the median portion of the mesonotal-mesopleural line in females instead of the anterior portion; (6) the presence of short hairs along the posterior, median mesonotal margin in some females; and (7) the presence of a mesopleural spot posterior to the black postocular stripe of the pronotum in many individuals.

Intraspecific Variation.— The color pattern in this species is quite variable (Figs. 81-85). Some female specimens have short hairs along the posterior, median mesonotal margin and the mesonotum slightly produced posteriorly. A small mesopleural spot posterior to the black postocular stripe of the pronotum is often present in both sexes; the presence of this character was variable even within a single

population. A relatively large number (20%) of the specimens examined were macropterous.

Natural History.— T. panamensis has been taken more commonly from lotic habitats but also inhabits lakes and ponds. Specimens have been collected each month except November. Matsuda (1962) presented measurements of antennal and leg segments for nymphs of T. panamensis and also figured the nymphs of this species; however, no information on eggs, eclosion, or developmental times was presented.

Distribution.— This water strider was previously known from Costa Rica (Matsuda, 1962), Panama, and Oaxaca, Mexico (Drake and Hottes, 1952; Drake and Chapman, 1953). It is now known from Mexico south to northern South America (Fig. 92). New records are given below for Colombia, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Venezuela, and the Mexican states of Chiapas, Guerrero, Jalisco, Mexico, Michoacan, Morelos, Nayarit, Sinaloa, and Sonora.

Material Examined.— COLOMBIA: Finca San Pablo, 1.9 mi. N of Alban, Aug. 1-12, 1967, 30m, 14f (AMNH), 5m, 4f (JTP).

COSTA RICA: lake, San Vito de Java, Dec. 29, 1969, 3m, 4f (JTP); Guanacaste, July 13, 1957, 1m (USNM); Rio Virilla, Dec. 20, 1931, 5m, 8f (UKL); San Jose, 5m, 5f (UKL); Rio Tiribi, San Jose, June 29, 1959, 1m, July 24, 1959, 6m, 4f, July 31, 1959, 2m, 1f, Aug. 22, 1959, 1m, 2f (UKL).

ECUADOR: Tena, Feb. 28, 1923, 1m, March 29-April 10, 1923, 2m (UKL).

EL SALVADOR: stream, El Charro, W of Santa Tecla, Dec. 20, 1969, 1m, 2f (JTP); Hac. San Jose, Metapan, May 20, 1975, 1f (UG); between El Chahuite and Asino, March 24, 1974, 1f (UG); Los Chorros Nat. Pk., July 16, 1961, 1m, 3f (LACM), Aug. 12, 1961, 2m, 3f (UCD), Aug. 28, 1961, 4m, 5f (LACM); Finca Sn. Benito, Ahuachapan, May 22, 1975, 4m, 1f (UG).

GUATEMALA: trib. to Rio Purgatoria, 24 mi. NW of Guatemala, April 22, 1947, 3m, 3f (UKL); stream, W of Mozatenango, March 26, 1947, 1f (UKL); 10 mi. E of Guatemala, Aug. 8, 1965, 1f (USNM); small river, Azucho, 15 mi. S of Escuintla, Dec. 20, 1969, 1m, 1f (JTP); stream, 10 mi. N of Ascuncion Mita, Jan. 10, 1970, 2f (JTP); stream, near L. Atescatempa, Jan. 10, 1970, 6m, 2f (JTP).

HONDURAS: Sabana Grande, July 22, 1957, 1m (USNM); Trujillo, Aug. 27, 1967, 6f (LACM); stream, Choluteca, July 20, 1957, 3m (USNM), 1f (BMNH), Dec. 22, 1969, 1m, 3f (JTP); San Marcos de Colon, July 28, 1965, 2m (USNM); 10 mi. N of Sabana Grande, July 29, 1965, 1m (USNM); Zamorano, July 22, 1948, 6m, 11f (UMAA).

MEXICO: Chiapas: San Vicente, Jan. 4, 1938, 3m, 3f (UKL); Tuxtla Gutierrez, Aug. 27, 1937, 2m, 3f (UKL); 2 mi. E of Rio de Oro, July 22, 1973, 2m, 2f (TAMU); 31 mi. SE of Comitán, July 18, 1965, 1f (TAMU); 15 mi. SE of Simojovel, July 9, 1958, 1m (UCB); 2 mi. W of Montebello Lakes, May 2, 1964, 1m (BMNH); small stream, 19 mi. N of Arriaga, May 1,

1964, 7m, 12f (JTP); El Zapotal, 2 mi. S of Tuxtla Gutierrez, July 12, 1957, 1f (JTP); 7 mi. N of Arriaga, May 1, 1964, 4m, 5f (JTP); stream, El Ocotol, Jan. 5, 1974, 1m, 1f (JTP); Rio Lajas, Soyalo, May 4, 1964, 2m, 4f (JTP); Montebello Lakes, May 3, 1964, 2m, 9f (JTP); Simojovel, July 22-Aug. 13, 1958, 2m, 6f (UCB), 1m, 3f (OSUC), 1m, 1f (JTP), 1m, 1f (CSU), 1f (BMNH); 14 mi. N of Arriaga, May 1, 1964, 1m, 4f (JTP), 1m, 1f (AMNH), 1m, 1f (OU), 1m (CSU), 1m, 1f (UKL). Guerrero: Garrapatas, Oct. 31, 1936, 1m, 2f (UKL). Jalisco: 10 mi. N of Chapala, April 22, 1964, 2f (JTP). Mexico: Tejupilco, June 16, 1933, 1f (CAS), 1f (UCB), 4f (UKL). Michoacan: 3 mi. W of Jacona, July 18, 1953, 1f (UKL); Zamora, Sept. 8, 1938, 20m, 22f (UKL); 10 mi. S of Chinapa, Sept. 5, 1938, 1m, 1f (UKL). Morelos: Tres Cumbres, Oct. 1, 1935, 1f (UKL); 8 mi. E of Zacatepec, April 25, 1964, 1m (JTP), 1f (CSU); Cuautla, April 25, 1964, 1f (JTP), Oct. 10, 1936, 3m, 9f (UKL). Nayarit: San Blas, Sept. 17-21, 1953, 1f (JTP); jungle river, San Blas, June 7, 1966, 1f (JTP); 7 mi. E of San Blas, April 21, 1964, 1f (JTP); Compostela, Aug. 26, 1959, 1f (LACM); Jesus Maria, July 6, 1955, 1m, 1f (UCB); 15 mi. N of Tepic, April 27, 1961, 1m (CNC). Oaxaca: Posita, Aug. 24, 1937, 14m, 26f (UKL); 9 mi. SW of Oaxaca, July 16, 1953, 3m, 5f (UKL); Oaxaca, Aug. 25, 1937, 4m, 4f (UKL), July 21, 1951, 2m (paratypes) (USNM); Tehuantepec, July 23, 1951, 2m (paratypes) (USNM); El Carmen, April 30, 1964, 5m, 8f (JTP); 12 mi. E of Oaxaca, April 29, 1964, 2f (JTP). Sinaloa: Arroyo Panuco, 2 mi. SW of Panuco, Dec. 20, 1970,

1f (NAU); 72 mi. N of Mazatlan, Feb. 1, 1962, 1m, 1f (CAS);
 Rio Concordia, 13.7 mi. E of Concordia, Dec. 29, 1963, 1m
 (CAS). Sonora: Rio Mayo, Salitral, Feb. 23, 1935, 10m,
 8f (UKL); Alamos, Aug. 28, 1971, 3m, 3f, Sept. 6, 1970, 3m,
 1f (USU); Arroyo Tarum, April 3, 1973, 1m (RET).

NICARAGUA: 3 mi. S of Esteli, Jan. 8, 1970, 1m, 6f
 (JTP).

PANAMA: Canal Zone, Feb. 10, 1939, 1m (holotype), 4m,
 5f (paratypes), 1f (not paratype) (USNM); Panama, Aug. 13,
 1934, 1m, 3f (paratypes), 1m (not paratype) (USNM); Taboga
 Island, Sept. 11, 1924, 2f (BMNH); stream, El Valle, Jan. 3,
 1970, 1m, 1f (JTP); Juan Mina, Canal Zone, Sept. 2, 1959,
 5m, 4f (UKL).

VENEZUELA: Curupao, D.F., Sept. 12, 1939, 1f (USNM);
 Rio Ocumare, Aragua, Dec. 23, 1951, 1f (UKL).

Fig. 64. Color pattern of female *T. panamensis*. Cordoba,
 Panama, Colombia.

Fig. 65. Color pattern of female *T. panamensis*. Mayatit,
 Mexico.



Fig. 81. Color pattern of male T. panamensis, Cundinamarca, Colombia.

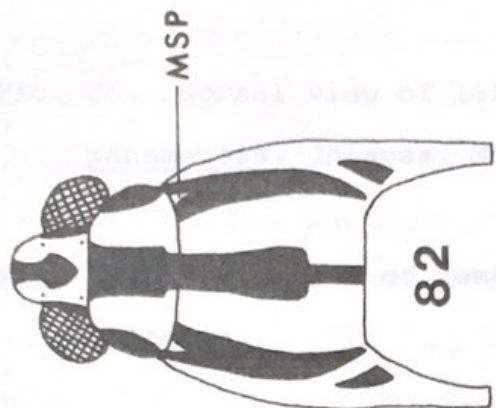
Fig. 82. Color pattern of male T. panamensis, Chiapas, Mexico. MSP, mesopleural spot.

Fig. 83. Color pattern of female T. panamensis, Chiapas, Mexico.

Fig. 84. Color pattern of female T. panamensis, Cundinamarca, Colombia.

Fig. 85. Color pattern of female T. panamensis, Nayarit, Mexico.





0.5 mm

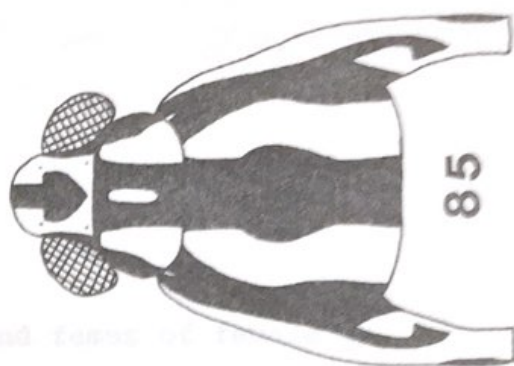
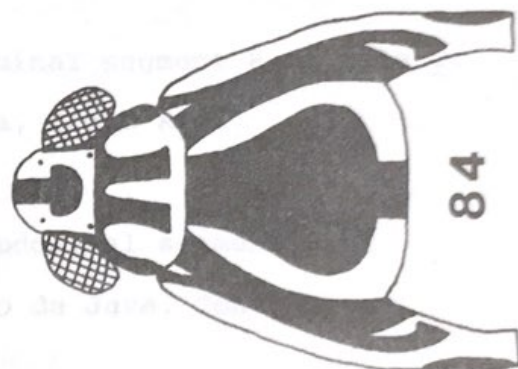
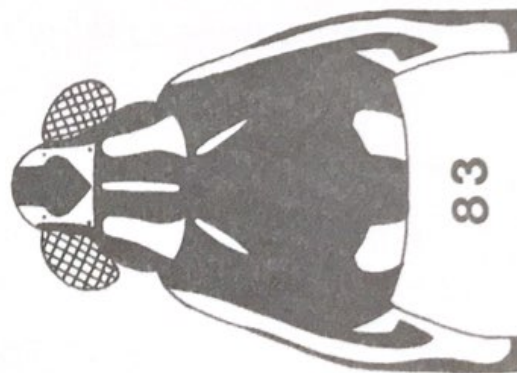


Fig. 86. Dorsal view of left hind femur of female T.
panamensis, Chiapas, Mexico.

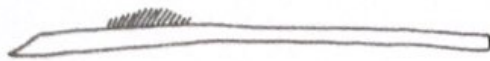
Fig. 87. Ventrite 7 of female T. panamensis, Cundinamarca,
Colombia.

Fig. 88. Dorsal profile of abdominal segment 8 of male T.
panamensis, San Vito de Java, Costa Rica.

Fig. 89. Left lateral view of abdominal segment 8 of
male T. panamensis, San Vito de Java, Costa Rica.

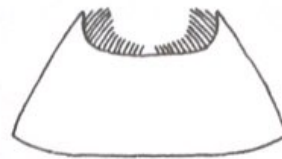
Fig. 90. Dorsal shaft of endosoma of T. panamensis, San
Vito de Java, Costa Rica.

Fig. 91. Left paramere of T. panamensis, near L. Atesca-
tempa, Guatemala.



86

0.5 mm



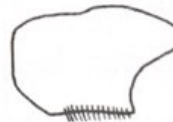
87

0.5 mm



88

0.5 mm



89



90

0.5 mm



91

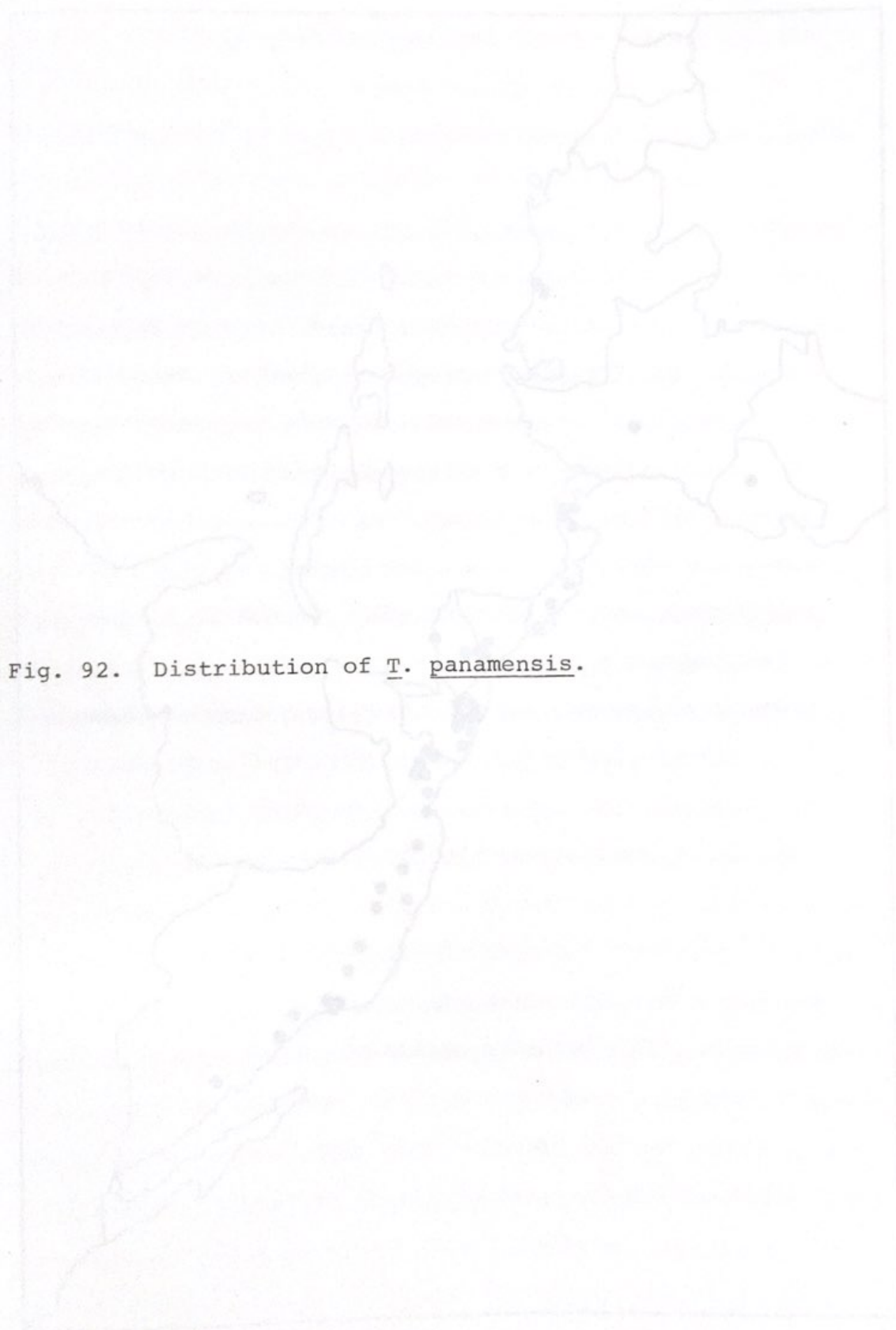
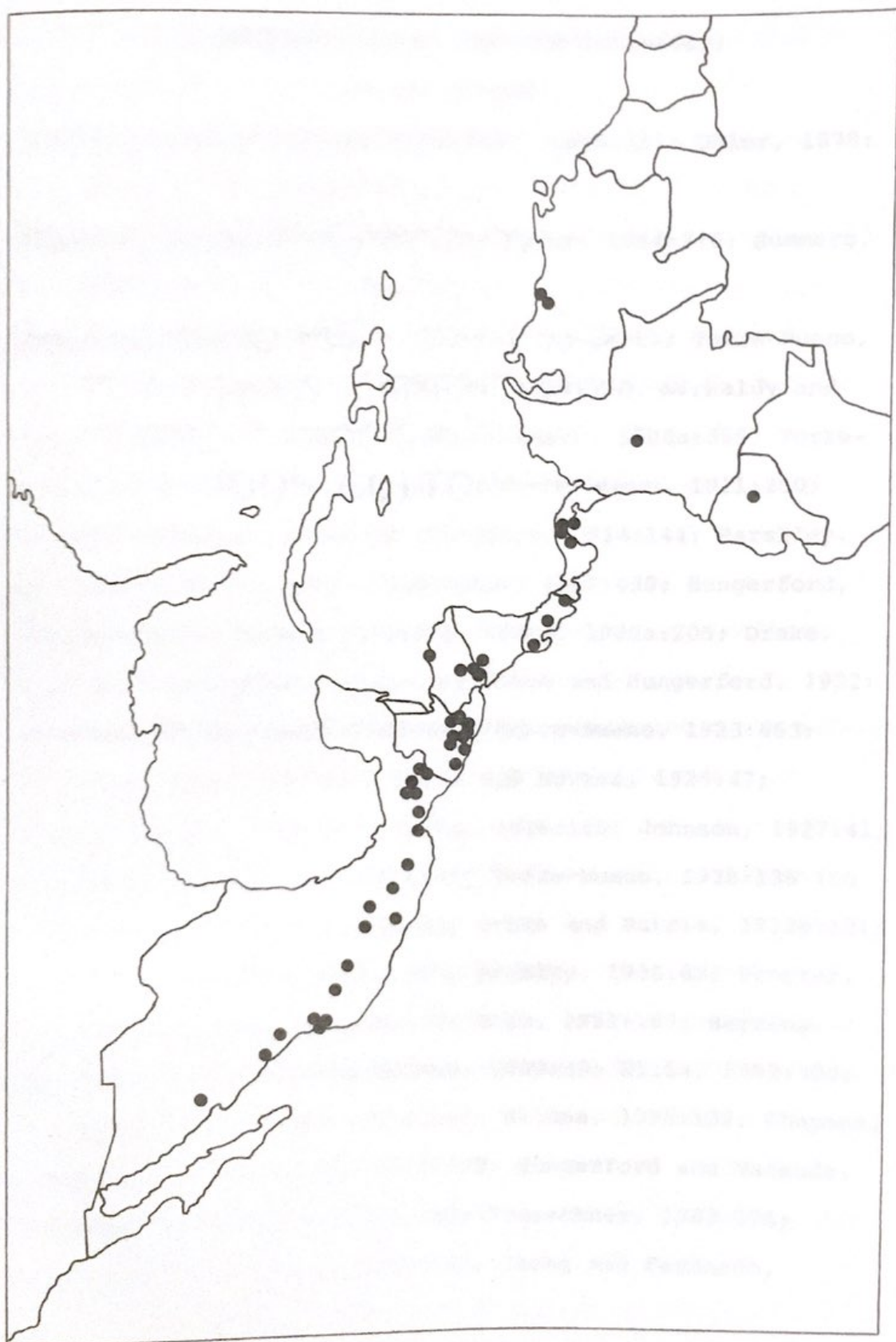


Fig. 92. Distribution of T. panamensis.



Trepobates pictus (Herrich-Schaeffer)

Figs. 93-110

Halobates pictus Herrich-Schaeffer, 1848:111; Uhler, 1878:437.

Stephania picta, White, 1883:79; Uhler, 1884:270; Summers, 1891:206.

Trepobates pictus, Uhler, 1894:213 (in part); Torre-Bueno, 1905:41 (in part); Bergroth, 1908:372; Kirkaldy and Torre-Bueno, 1908:212; Torre-Bueno, 1908a:389; Torre-Bueno, 1908b:234 (in part); Torre-Bueno, 1911:250; Torre-Bueno, 1912:212; Parshley, 1914:144; Parshley, 1917:108 (in part); Van Duzee, 1917:430; Hungerford, 1919:115; Hussey, 1919:13; Drake, 1920a:205; Drake, 1920b:19; Drake, 1922:116; Moore and Hungerford, 1922:417; Torre-Bueno, 1922:121; Torre-Bueno, 1923:663; Alexander, 1925:457; Drake and Hottes, 1925:47; Blatchley, 1926:985; Esaki, 1926:140; Johnson, 1927:41; Drake and Harris, 1928b:26; Torre-Bueno, 1928:136 (in part); Schroeder, 1931:83; Drake and Harris, 1932b:121; Deay and Gould, 1936a:767; Brimley, 1938:82; Procter, 1938:61; Herring, 1950:30; Bobb, 1951:107; Herring, 1951:147; Drake and Hottes, 1952:38; Ellis, 1952:324; Drake and Chapman, 1953:112; Wilson, 1958:132; Chapman, 1959:9; Hungerford, 1959:959; Hungerford and Matsuda, 1960:22; Matsuda, 1960:338; Froeschner, 1962:226; Schaefer and Drew, 1968:132; Cheng and Fernando,

1970:10; Bobb, 1974:74; Gonsoulin, 1974:531; Kittle
(in press).

Diagnosis.— T. pictus can be separated from its congeners by the shape, length, and hairiness of the posterior mesonotal projection in females, short hairs on the middle femur in males, and the shape of the male paramere.

Description.— HEAD: Marked with black and light yellow (Figs. 93-98). Antennae: segment 1 slightly bowed at base, dark brown apically, pale yellow at base, the extent of yellow color variable; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 very light in color; 3 mostly dark brown, pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 93-98). Pronotum in macropterous form prolonged posteriorly, black except for broad, light yellow longitudinal stripes which continue around posterior margin and sometimes a median, light yellow stripe anteriorly. Prosternum pale yellow. Anterior femur moderately bowed just beyond middle in males, slightly bowed near base in females; mostly dark brown with pale yellow markings, a pale yellow ring at apex usually present; not constricted at apex in males. Tibia slightly bowed in males, straight in females; mostly dark brown in males, mostly pale yellow in females. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow

markings (Figs. 93-98); prolonged posteriorly in females, this projection highly variable in shape and hairiness (Figs. 99-103); a patch of short to moderately long, dark hairs usually present along median portion of mesonotal-mesopleural line in females. A light yellow mesopleural stripe posterior to black postocular stripe of pronotum present (Fig. 94). Mesosternum pale yellow, black color of mesopleuron sometimes extending onto anterior margin. Middle femur with dark brown and pale yellow longitudinal stripes, males with a thick ventral fringe of short, dark brown hairs (Fig. 104); these hairs, at maximum length, approximately 20-40% of the diameter of the femur. Tibia dark brown; males with a single ventral row of short hairs along basal one-fourth which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 30% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum with black and light yellow markings; without a median patch of hairs in females, the median metanotal area covered by the posterior mesonotal projection. Metasternum pale yellow. Posterior femur mostly pale yellow, without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black with light yellow markings in males, mostly light yellow in females; some gray-blue bloom present, especially in males. Ventrites mostly pale yellow, a small amount of dark brown along sides

in some individuals; ventrite 7 in females with a row of hairs along posterior margin, this row interrupted at middle (Fig. 105); these hairs variable in length and darkness. Connexival segments mostly light yellow, with black anterior margins; lateral margins of segments 5 and 6 in males and 6 and 7 in females with moderately long, dark hairs; connexiva in females with an apical tuft of moderately long, dark hairs and very slightly produced, but without long spines.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 106; with short, pale pubescence ventrally (Fig. 107). Pygophore with a few pale, long hairs at middle; short, pale pubescence posteriorly. Dorsal shaft of endosoma as in Fig. 108. Paramere sharply pointed at apex (Fig. 109).

Measurements.— **HEAD:** Transocular width of male 0.96-1.05 mm (1.00), female 0.97-1.12 mm (1.04). Interocular space of male 0.36-0.40 mm (0.39), female 0.40-0.45 mm (0.43). Antennae: male— 1) 0.96-1.26 mm (1.10), 2) 0.50-0.63 mm (0.56), 3) 0.52-0.65 mm (0.59), 4) 0.55-0.68 mm (0.61); female— 1) 0.78-0.99 mm (0.85), 2) 0.44-0.63 mm (0.51), 3) 0.54-0.69 mm (0.59), 4) 0.56-0.68 mm (0.61).

PROTHORAX: Pronotum: male— 0.83-0.97 mm (0.88) wide, 0.40-0.48 mm (0.44) long; female— 0.80-0.98 mm (0.91) wide, 0.33-0.43 mm (0.39) long. Anterior femur in male 1.35-1.59 mm (1.48), female 1.22-1.39 mm (1.31). Tibia in male 0.94-1.11 mm (1.05), female 0.91-1.09 mm (0.99).

Tarsus 1 in male 0.07-0.09 mm (0.08), female 0.07-0.12 mm (0.09). Tarsus 2 in male 0.36-0.45 mm (0.41), female 0.36-0.45 mm (0.41).

MESOTHORAX: Mesonotum: male— 1.26-1.59 mm (1.44) wide, 0.86-1.04 mm (0.97) long; female— 1.60-1.96 mm (1.85) wide, 1.35-1.73 mm (1.53) long. Middle femur in male 1.73-2.09 mm (1.90), female 1.80-2.22 mm (2.02). Tibia in male 3.03-3.76 mm (3.44), female 3.29-4.26 mm (3.74). Tarsus 1 in male 0.93-1.19 mm (1.09), female 1.04-1.31 mm (1.18). Tarsus 2 in male 0.73-0.99 mm (0.87), female 0.89-1.02 mm (0.97).

METATHORAX: Posterior femur in male 2.25-2.70 mm (2.48), female 2.24-2.89 mm (2.63). Tibia in male 1.23-1.49 mm (1.35), female 1.26-1.73 mm (1.47). Tarsus 1 in male 0.43-0.59 mm (0.51), female 0.48-0.66 mm (0.55). Tarsus 2 in male 0.31-0.40 mm (0.36), female 0.35-0.43 mm (0.38).

SIZE: Length— male 3.00-3.56 mm (3.34), female 3.27-4.11 mm (3.70). Width— male 1.26-1.59 mm (1.44), female 1.60-1.96 mm (1.85).

Type Data.— The original description was based upon a female from North America which is assumed to be lost. Considering the original description and figures (Herrich-Schaeffer, 1848), there is no doubt about the identity of this species, and the designation of a neotype is judged to be unnecessary.

Taxonomy.— For almost 80 years, a complex of several

species of Trepobates was confused in the literature with T. pictus. References to T. pictus until 1926 and even later often apply to two or three species, and sometimes the true T. pictus is not even included. T. pictus can be separated from all other Trepobates except T. n. sp. 2 by the presence of a posterior mesonotal projection in females. Discrimination of T. pictus and T. n. sp. 2 was discussed in the taxonomy section under the latter species (see page 93).

Intraspecific Variation.— The color pattern of T. pictus is extremely variable (Figs. 93-98). Yellow markings predominate in most specimens examined from the southern United States, but yellow markings are greatly reduced in northeastern United States populations. Specimens from other parts of the range showed no general trends of color pattern. The posterior mesonotal projection in females is extremely variable in shape and hairiness (Figs. 99-103); however, Figs. 99-101 are typical of the majority of specimens. Most females examined had a patch of short or moderately long hairs along the median portion of the mesonotal-mesopleural line. Females from the eastern United States have long, dark hairs along the posterior margin of the seventh ventrite while those from the western part of the range have short, light hairs. The macropterous form of T. pictus is rare and represented only 2% of the specimens examined.

Natural History.— T. pictus is not an abundant species but may be locally common. It has been most commonly collected from lotic habitats but also occurs on ponds. This

species was collected in close association with T. knighti, Rheumatobates palosi, and R. tenuipes during the present study. Collection dates are given below for each month from April through November; the majority of these are from July through October. Gonsoulin (1974) reported the collection of this species during December in Louisiana. The following observations on food habits of T. pictus were made in Washington County, Arkansas, during the present study: one adult feeding on a small spider (Theridiidae); two adults, three fourth instar nymphs, and one fifth instar nymph feeding on springtails (Entomobryidae); and two fifth instar nymphs feeding on winged ants (Formicidae). A single pair was taken in copula in August in Washington County, Arkansas. Life history information on T. pictus is presented in a later section.

Distribution.— This water strider has a wide distribution throughout the eastern one-half of the United States and is also known from southern Canada (Fig. 110). Records from Louisiana (Gonsoulin, 1974) and Ontario, Canada (Cheng and Fernando, 1970) are accepted as accurate and are included in Fig. 110. The records of T. pictus from Utah (Moore and Hungerford, 1922) probably apply to T. becki.

Material Examined.— UNITED STATES: Alabama: "Alab.", 1m, 1f (LSU), 2f (UKL). Madison Co.: Huntsville, Aug. 20, 1968, 1f (JTP). Arkansas: Washington Co.: Wildcat Cr., 2 mi. W of Harmon, July 1, 1975, 4m, 5f, Aug. 21, 1972, 2m, 4f, Aug. 31, 1975, 3f, Sept. 6, 1972, 8m, 17f, Sept. 12,

1973, 8m, 22f (PDK). Connecticut: Litchfield Co.: Terryville, Aug. 2, 1957, 1f (USNM). Tolland Co.: Fenton R., Mansfield, Sept. 20-22, 1959, 1m, 1f (UCS). District of Columbia: June 21, 2f, Sept. 20, 1887, 1m (CU), July 8, 1895, 2f (UKL). Florida: Okaloosa Co.: Baggett Cr., 2 mi. W of Milligan, June 13, 1974, 1m, 1f (UG). Georgia: Bibb Co.: Macon, July 25, 1930, 1m, 1f (UKL). Clarke Co.: Ben Burton City Pk., July 1, 1974, 1f (UG); Bear Cr., 2.5 mi. NE of Bogart, July 9, 1974, 2m, 2f, Aug. 26, 1972, 4m, 4f, Oct. 5, 1975, 1f (UG); Fowler's Mill Cr., 7.6 mi. WNW of Athens, Oct. 19, 1974, 1m, 5f, Oct. 27, 1974, 2m, 3f (UG). Dekalb Co.: Stone Mountain, July 8, 1944, 11m, 13f (UCB). Franklin Co.: V. Bryant St. Pk., Oct. 20, 1974, 4m, 4f (UG). Fulton Co.: East Point, Aug. 28, 1966, 6m, 4f (USNM). Gordon Co.: Calhoun, Aug. 20, 1949, 1f (HCC). Madison Co.: Sulphur Spring Branch, 1.25 mi. SE of Hull, July 4, 1973, 3m, 2f (UG). Monroe Co.: Dames Ferry, May 25, 1945, 1m (UCB); Rum Cr. and Ga. 18, Nov. 3, 1972, 1f (UG). Oglethorpe Co.: Echol's Mill, Aug. 16, 1973, 1m (UG). Richmond Co.: Elephant Rock Cr., Sept. 13, 1975, 1f, Oct. 19, 1975, 1f (CUSC). Talbot Co.: Prattsburg, July 25, 1930, 9m, 3f (UKL). Illinois: Hardin Co.: Hog Thief R., Martha Furnace, Oct. 30, 1894, 1m (INHS). Pope Co.: Lusk Cr., July 7, 1967, 1m, 2f, July 15, 1967, 2m, 4f, Aug. 4, 1968, 1f, Aug. 26, 1967, 2f, Oct. 4, 1967, 4m, 5f, Oct. 31, 1967, 1m (SIU); Herod, June 23, 1927, 2m, 2f (INHS). Union Co.: Winter's Pond, Sept. 6, 1976, 2m, 6f (SIU); stream, 5 mi. SE of Anna,

Sept. 25, 1976, 33m, 70f (PDK); stream, 2 mi. WNW of Jonesboro, Sept. 25, 1976, 4m, 3f (PDK); Wolf Lake Swamp, July 4, 1959, 1f (JTP). Indiana: Harrison Co.: Aug. 31, 1934, 1m, 3f (PU). Putnam Co.: stream, 6 mi. S of Putnamville, Sept. 3, 1976, 2m, 3f (PDK). Tippecanoe Co.: Lafayette, Aug. 21, 1932, 1f (USNM), Sept. 26, 1931, 1f, Oct. 8, 1932, 1f (PU). Kentucky: Crittenden Co.: Hurricane Cr., 0.5 mi. S of Crittenden Springs, Oct. 24, 1973, 1f (INHS); Piney Cr., Deanwood, Oct. 24, 1973, 1f (INHS). McCracken Co.: Sept. 11, 1932, 2m, 3f (PU), 1f (UKL). Maine: Penobscot Co.: pond, Orono, Sept. 15, 1913, 2f (CAS). Maryland: Anne Arundel Co.: Annapolis, Sept. 18, 1932, 1f (UKL). Montgomery Co.: Sept. 19, 1933, 1m, 1f (PU); Sligo Glen, July 18, 1f (CU), 1f (USNM). Prince Georges Co.: Beltsville, Sept. 25, 1932, 8m, 11f (UKL), 1m (OU), Oct. 2, 1932, 14m, 14f (UKL), 1m (OU). County unknown: Lalseland, Sept. 12, 1931, 10m, 26f (UKL). Massachusetts: Norfolk Co.: Wellesley, Sept. 10, 1904, 3m, 3f (AMNH), 1f (CAS). Michigan: Ingham Co.: Sept. 22, 1949, 1f (HCC); East Lansing, Sept. 16, 1932, 1f (LSU), Sept. 29, 1964, 1m (ISU). Mississippi: Adams Co.: Washington, Sept. 16, 1924, 2m, 2f (LSU), 1f (CAS). Copiah Co.: Hazlehurst, Nov. 5, 1949, 2m, 2f (MSU). Franklin Co.: Bude, Nov. 5, 1949, 4m, 3f (MSU). Harrison Co.: Oct. 22, 1949, 1f (MSU), 1f (JTP). Hinds Co.: Jackson, Nov. 5, 1949, 1f (MSU). Jackson Co.: Biloxi, Oct. 22, 1949, 1m, 1f (JTP); Ocean Springs, July 25, 1951, 2m, 3f (MSU), 2f (USNM); Vancleave, Aug. 20, 1951, 1m,

1f (MSU). Jefferson Co.: Lorman, Nov. 6, 1949, 3m, 3f (MSU). Lowndes Co.: Columbus, Oct. 2, 1948, 1m, 4f (MSU). Monroe Co.: Hamilton, July 15, 1930, 2m, 3f (UKL); Smithville, July 15, 1930, 1f (UKL). Montgomery Co.: Stewart, Oct. 16, 1948, 4m, 3f (MSU); Winona, Oct. 16, 1948, 3m, 9f (MSU), 2f (UCS), 2f (USNM). Newton Co.: Union, April 1, 1949, 1f (MSU). Oktibbeha Co.: Sturgis, Oct. 21, 1949, 1m, 3f (MSU), 1f (USNM). Pike Co.: Summit, Sept. 4, 1926, 1m, 1f (LSU); McComb, Sept. 8, 1924, 1f (LSU). Pontotoc Co.: Toccopola, Oct. 8, 1949, 2m, 14f (MSU), 1m, 1f (USNM). Simpson Co.: Saratoga, Aug. 1, 1951, 3m (MSU). Tallahatchie Co.: Charleston, Sept. 7, 1925, 1m, 1f (LSU), 1m (CAS). Webster Co.: Eupora, Oct. 16, 1948, 4f (MSU). Winston Co.: Fearn Springs, Sept. 30, 1949, 2m, 3f (MSU). County unknown: Ramsey Springs, Aug. 5, 1951, 1m, 6f (MSU), 1m, 1f (USNM), Oct. 1, 1949, 1m, 1f (UCS). Missouri: Perry Co.: Apple Cr., 0.5 mi. S of Uniontown, Sept. 27, 1976, 1f (PDK). New Hampshire: Strafford Co.: Durham, Aug. 15, 1900, 1f (UNH). New Jersey: Mercer Co.: Hightstown, Sept. 25, 1957, 1m, 2f (JTP), 1m, 2f (HCC), 1m (RU). Morris Co.: Great Swamp, Sept. 15, 1968, 12m, 37f (JTP); Millington, Oct. 9, 1957, 1m, 1f (JTP). Middlesex Co.: Jamesburg, Sept. 9, 1957, 2m, 2f (JTP), 1m, 1f (HCC), 1m, 1f (UMAA), 1m (FSCA); stream, New Brunswick, Sept. 17-18, 1957, 17m, 16f (USNM), 6m, 3f (HCC), 1m, 1f (BMNH), 1f (JTP). Ocean Co.: Lakehurst, Oct. 18, 1903, 1f (UKL). New York: Putnam Co.: L. Mahopac, Sept. 5, 1903, 1f (UKL). St. Lawrence Co.:

Canton, Sept. 19, 1967, 3f (YU). Tompkins Co.: Ithaca, July 27, 1894, 1f (CU). North Carolina: Transylvania Co.: Toxaway, Aug. 30, 1957, 4m (CNC). Wake Co.: Raleigh, Oct. 20, 1920, 1f (LSU). Ohio: Greene Co.: Little Miami R., Spring Valley Twp., Sept. 1, 1976, 1f (DMNH). Williams Co.: Sept. 14, 1933, 1f (PU). Pennsylvania: Adams Co.: Arendtsville, July 16, 1931, 2m, 1f (UKL). Bedford Co.: Aug. 6-7, 2f (CU), 1f (AMNH). Lebanon Co.: Mt. Gretna, Aug., 1932, 1m (ISU). Northumberland Co.: Sept. 18, 1933, 2m, 1f (PU). Wayne Co.: Honesdale, Aug. 11-22, 1916, 1f (AMNH). Rhode Island: Providence Co.: Nasonville, Sept. 29, 1964, 1m, 1f (PC); Providence, Sept. 10, 1964, 1f (PC); South Foster, Oct. 20, 1964, 1m (PC). County unknown: Ponaganset R., Oct. 20, 1964, 1m (PC). South Carolina: Lexington Co.: Batesburg, Aug. 24, 1930, 3m, 2f (UKL). Tennessee: Anderson Co.: Grassy Cr., Sept. 15, 1975, 2lm, 15f (RTM). Chester Co.: stream, 2.6 mi. SE of Pinson, Aug. 31, 1954, 1m, 3f (UMAA). Knox Co.: Knoxville, June 15, 1890, 1f (LSU), June 18, 1890, 1m (CAS), July 4, 1891, 1m, 1f (LSU), 1f (ISU), July 10, 1891, 1m (CU), July 23, 1890, 1f (ISU), July 25, 1890, 1f (LSU). County unknown: Coal Creek, Aug. 27, 1930, 3m, 1f (UKL). Texas: Cass Co.: spring-fed stream, 10 mi. N of Linden, June 28, 1975, 4m, 3f (PDK). Virginia: Fairfax Co.: Sept. 19, 1933, 1f (PU). Fauquier Co.: Paris, July 27, 1898, 1f (USNM). Goochland Co.: July 2, 1948, 1m, 3f (VPI). Louisa Co.: July 2, 1948, 3f (VPI). Nelson Co.: June 19, 1947, 1f (VPI).

Westmoreland Co.: Sept. 20, 1933, 2m, 2f (PU). City of
 Falls Church: Falls Church, Sept. 10, 1f (AMNH). West
Virginia: Wyoming Co.: July 13, 1947, 1f (VPI).

Fig. 33. Color pattern of male *T. pictus*, Providence Co.,
 Rhode Island.

Fig. 34. Color pattern of male *T. pictus*, Middlesex Co.,
 New Jersey. MST, mesopleural stripe.

Fig. 35. Color pattern of male *T. pictus*, Fulton Co.,
 Georgia.

Fig. 36. Color pattern of female *T. pictus*, Litchfield Co.,
 Connecticut.

Fig. 37. Color pattern of female *T. pictus*, Mercer Co.,
 New Jersey.

Fig. 38. Color pattern of female *T. pictus*, Fulton Co.,
 Georgia.

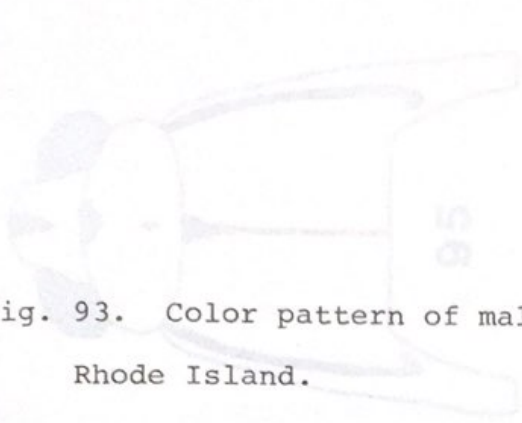


Fig. 93. Color pattern of male T. pictus, Providence Co., Rhode Island.

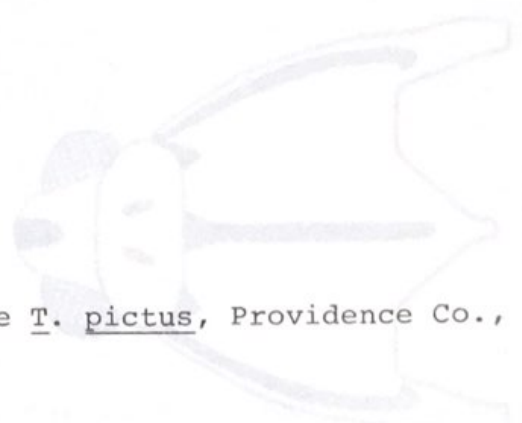


Fig. 94. Color pattern of male T. pictus, Middlesex Co., New Jersey. MST, mesopleural stripe.

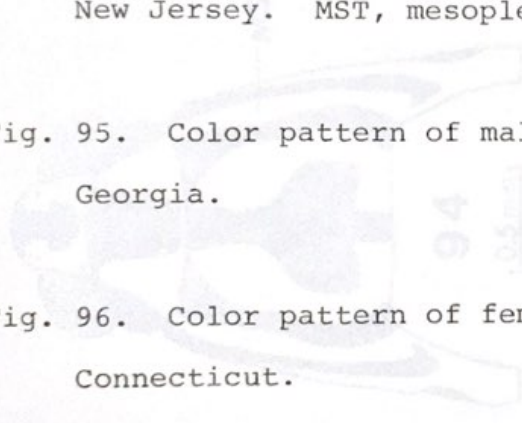


Fig. 95. Color pattern of male T. pictus, Fulton Co., Georgia.

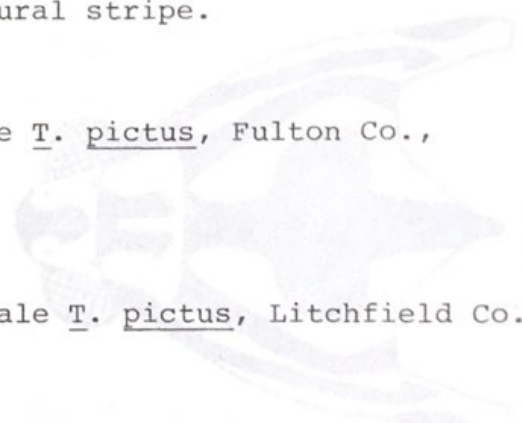


Fig. 96. Color pattern of female T. pictus, Litchfield Co., Connecticut.

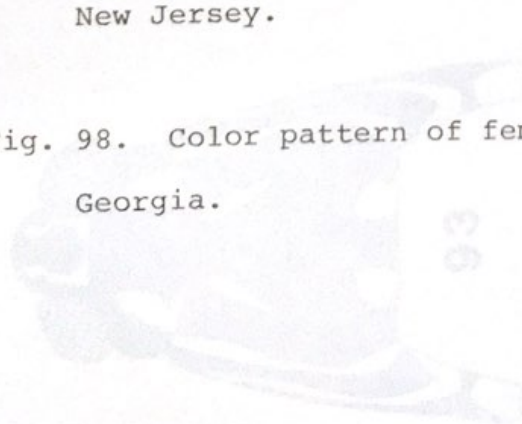


Fig. 97. Color pattern of female T. pictus, Mercer Co., New Jersey.

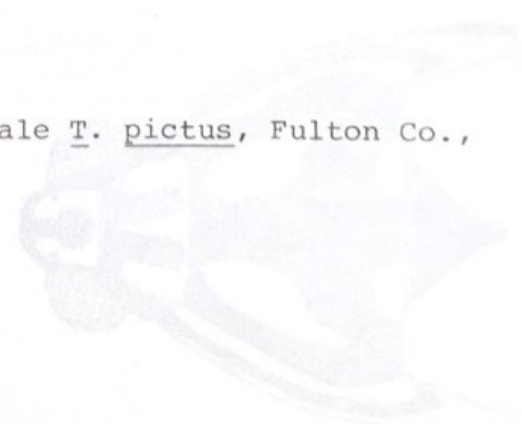


Fig. 98. Color pattern of female T. pictus, Fulton Co., Georgia.





Fig. 99. Posterior mesonotal projection of female T. pictus,
City of Falls Church, Virginia.

Fig. 100. Posterior mesonotal projection of female T.
pictus, Pope Co., Illinois.

Fig. 101. Posterior mesonotal projection of female T.
pictus, Adams Co., Mississippi.

Fig. 102. Posterior mesonotal projection of female T.
pictus, Pike Co., Mississippi.

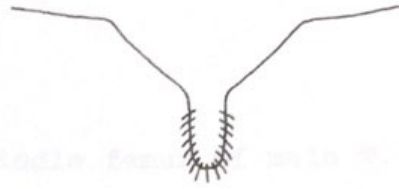
Fig. 103. Posterior mesonotal projection of female T.
pictus, Cass Co., Texas.



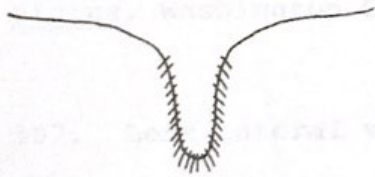
103



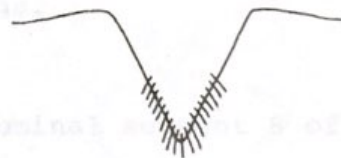
99



100



101



102



103

0.5 mm

104

Fig. 104. Lateral view of left middle femur of male T. pictus, Middlesex Co., New Jersey.

Fig. 105. Ventrite 7 of female T. pictus, Union Co., Illinois.

105

Fig. 106. Dorsal profile of abdominal segment 8 of male T. pictus, Washington Co., Arkansas.

Fig. 107. Left lateral view of abdominal segment 8 of male T. pictus, Washington Co., Arkansas.

106

0.5 mm

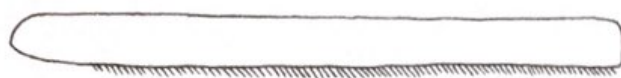
107

Fig. 108. Dorsal shaft of endosoma of T. pictus, Washington Co., Arkansas.

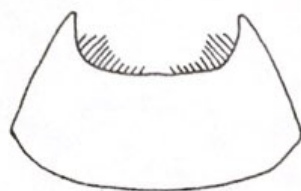
Fig. 109. Left paramere of T. pictus, Washington Co., Arkansas.

108

109



104



105



106

0.5 mm



107



108

0.1 mm



109

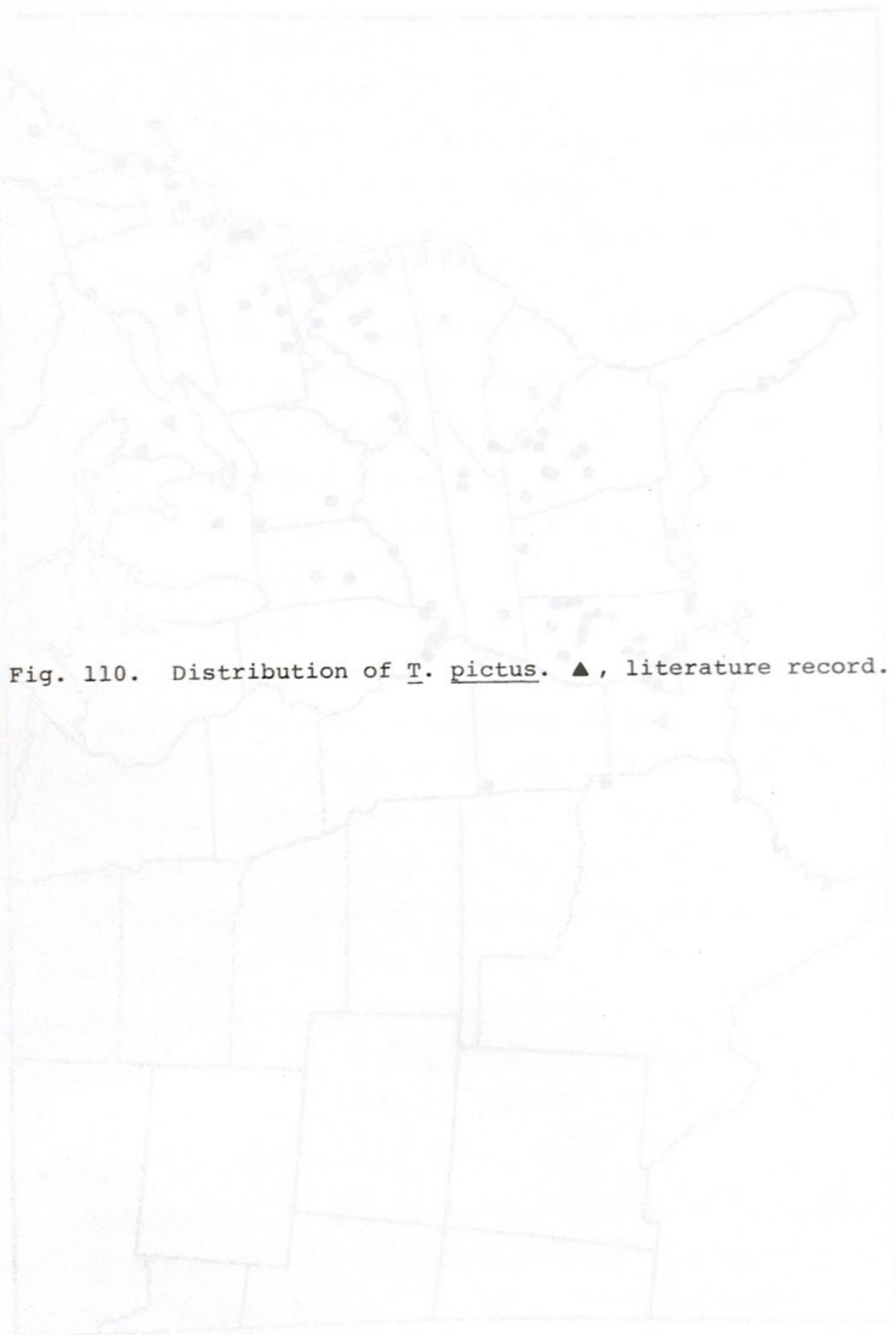
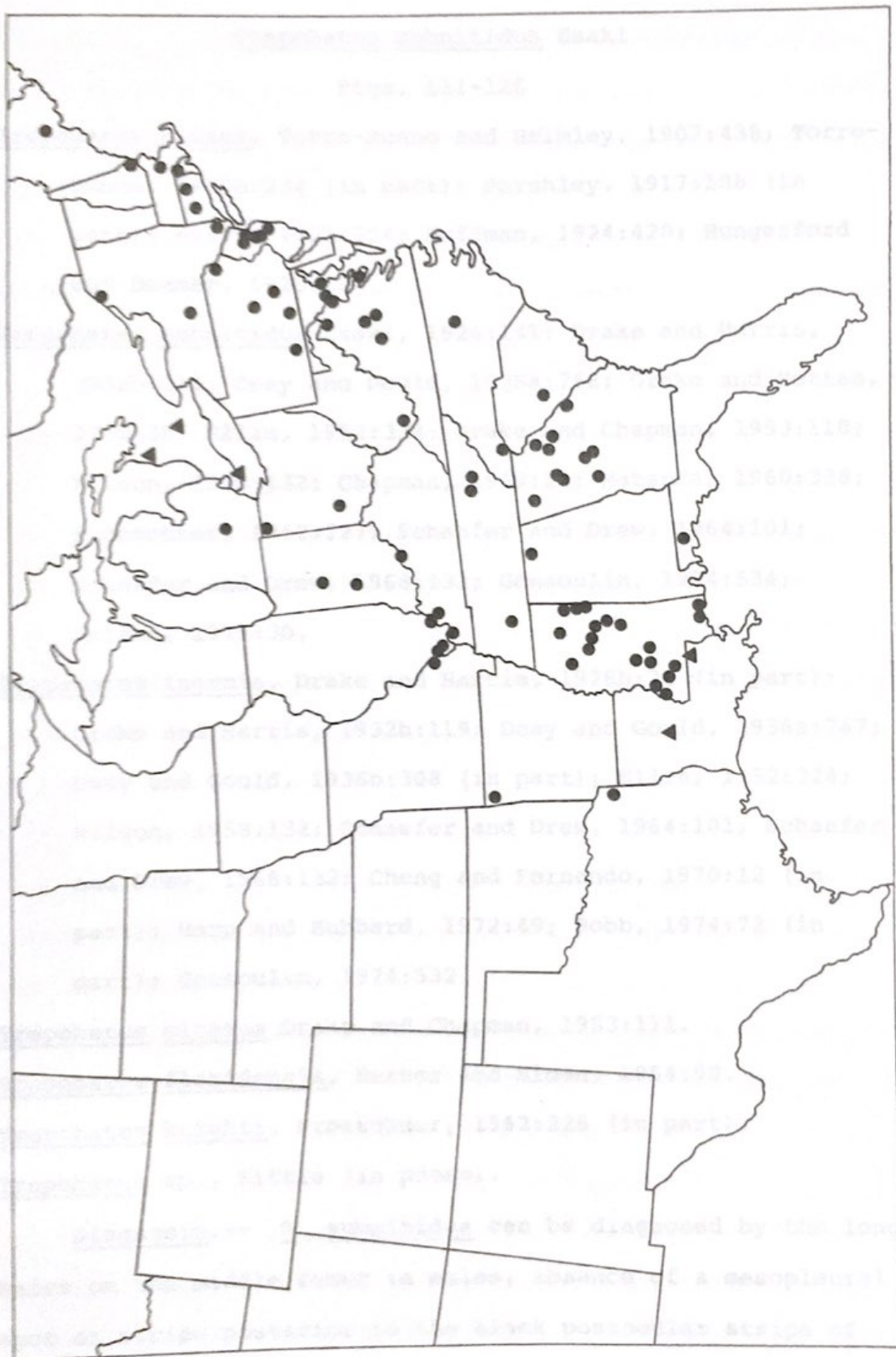


Fig. 110. Distribution of T. pictus. ▲, literature record.



Trepobates subnitidus Esaki

Figs. 111-126

Trepobates pictus, Torre-Bueno and Brimley, 1907:438; Torre-Bueno, 1908b:234 (in part); Parshley, 1917:108 (in part); Wiley, 1923:204; Hoffman, 1924:420; Hungerford and Beamer, 1925:264.

Trepobates subnitidus Esaki, 1926:141; Drake and Harris, 1932b:119; Deay and Gould, 1936a:768; Drake and Hottes, 1952:38; Ellis, 1952:324; Drake and Chapman, 1953:110; Wilson, 1958:132; Chapman, 1959:10; Matsuda, 1960:338; Froeschner, 1962:227; Schaefer and Drew, 1964:101; Schaefer and Drew, 1968:132; Gonsoulin, 1974:534; Reisen, 1975:30.

Trepobates inermis, Drake and Harris, 1928b:26 (in part); Drake and Harris, 1932b:119; Deay and Gould, 1936a:767; Deay and Gould, 1936b:308 (in part); Ellis, 1952:324; Wilson, 1958:132; Schaefer and Drew, 1964:101; Schaefer and Drew, 1968:132; Cheng and Fernando, 1970:12 (in part); Harp and Hubbard, 1972:49; Bobb, 1974:72 (in part); Gonsoulin, 1974:532.

Trepobates citatus Drake and Chapman, 1953:111.

Trepobates floridensis, Berner and Sloan, 1954:98.

Trepobates knighti, Froeschner, 1962:226 (in part).

Trepobates sp., Kittle (in press).

Diagnosis.— T. subnitidus can be diagnosed by the long hairs on the middle femur in males, absence of a mesopleural spot or stripe posterior to the black postocular stripe of

the pronotum, absence of a constriction or swelling at the apex of the fore femur in males, and absence of long hairs on the posterior margin of the seventh ventrite and inner basal margin of the hind femur in females.

Description.— HEAD: Marked with black and light yellow (Figs. 111-116). Antennae: segment 1 slightly bowed at base, dark brown to black apically, pale yellow basally, yellow color more extensive in females; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 very light in color, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, sometimes pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 111-116). Pronotum in macropterous form prolonged posteriorly, black with light yellow markings on anterior portion and posterior margin, also laterally in some individuals. Prosternum pale yellow. Anterior femur strongly bowed at middle in males, slightly bowed near base in females; mostly dark brown to black with pale yellow basally and usually a pale yellow ring at apex; very slightly constricted at apex in males. Tibia slightly bowed in males, straight in females; mostly dark brown to black, sometimes pale yellow dorsally and apically, especially in females.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 111-116), not prolonged posteriorly in females; a patch of short, dark hairs along posterior portion

of mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum absent. Black color of mesopleuron extending onto anterior margin of mesosternum, remainder of mesosternum light yellow. Middle femur with dark brown to black and pale yellow longitudinal stripes, males with a thick ventral fringe of long, dark brown hairs (Fig. 117); these hairs, at maximum length, approximately 60-100% of the diameter of the femur. Tibia dark brown; males with a single ventral row of long hairs along basal one-half which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 100-160% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum usually black with paired light yellow markings, sometimes entirely black; usually with a median patch of long, dark hairs in females. Metasternum pale yellow. Posterior femur mostly dark brown to black but sometimes with a light yellow stripe dorsally; without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown to black.

ABDOMEN: Abdominal tergites mostly or entirely black, sometimes marked with light yellow, especially in females; covered with a gray-blue bloom, more extensive in males. Ventrites mostly pale yellow and black laterally in both sexes, males also with black along anterior margins; ventrite 7 in females without long hairs posteriorly. Connexival segments usually light yellow with black anterior margins,

sometimes entirely black; lateral margins of segment 5 and sometimes 6 in males with moderately long, dark hairs; segments 4-6 and sometimes 3 and 7 in females with long, dark hairs; connexiva in females usually not produced apically, but with long, hairy spines in some populations (Fig. 121).

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 122; with short, thin pale pubescence ventrally (Fig. 123). Pygophore covered with mostly dark pubescence at middle and posteriorly; moderately long at middle and short posteriorly. Dorsal shaft of endosoma shown in Fig. 124. Paramere as in Fig. 125.

Measurements.— HEAD: Transocular width of male 0.86-1.01 mm (0.97), female 0.96-1.04 mm (0.99). Interocular space of male 0.34-0.39 mm (0.36), female 0.38-0.43 mm (0.40). Antennae: male— 1) 0.93-1.06 mm (0.97), 2) 0.44-0.56 mm (0.49), 3) 0.45-0.56 mm (0.52), 4) 0.50-0.60 mm (0.57); female— 1) 0.73-0.91 mm (0.81), 2) 0.40-0.53 mm (0.46), 3) 0.41-0.56 mm (0.49), 4) 0.52-0.62 mm (0.56).

PROTHORAX: Pronotum: male— 0.73-0.88 mm (0.82) wide, 0.41-0.51 mm (0.47) long; female— 0.79-0.93 mm (0.86) wide, 0.36-0.41 mm (0.39) long. Anterior femur in male 1.32-1.55 mm (1.43), female 1.02-1.45 mm (1.28). Tibia in male 0.89-1.04 mm (0.97), female 0.79-1.09 mm (0.93). Tarsus 1 in male 0.06-0.10 mm (0.08), female 0.07-0.10 mm (0.09). Tarsus 2 in male 0.36-0.46 mm (0.42), female 0.40-0.56 mm (0.46).

MESOTHORAX: Mesonotum: male— 1.18-1.45 mm (1.33)

wide, 0.83-0.96 mm (0.91) long; female— 1.61-1.96 mm (1.80) wide, 0.98-1.17 mm (1.07) long. Middle femur in male 1.59-1.90 mm (1.72), female 1.70-2.17 mm (1.88). Tibia in male 2.82-3.76 mm (3.25), female 3.17-3.91 mm (3.53). Tarsus 1 in male 0.79-1.09 mm (1.02), female 1.03-1.28 mm (1.19). Tarsus 2 in male 0.79-0.99 mm (0.87), female 0.96-1.09 mm (1.01).

METATHORAX: Posterior femur in male 2.13-2.76 mm (2.43), female 2.23-2.89 mm (2.49). Tibia in male 1.02-1.36 mm (1.18), female 1.15-1.39 mm (1.26). Tarsus 1 in male 0.40-0.56 mm (0.49), female 0.43-0.60 mm (0.53). Tarsus 2 in male 0.28-0.36 mm (0.32), female 0.34-0.43 mm (0.37).

SIZE: Length— male 3.14-3.59 mm (3.38), female 3.42-4.03 mm (3.75). Width— male 1.18-1.45 mm (1.33), female 1.61-1.96 mm (1.80).

Type Data.— Two female syntypes of T. subnitidus are in the Hungarian Natural History Museum, Budapest, and one specimen was examined during this study. The type specimens were collected by W. J. Gerhard on July 4, 1904, at Clarke Junction, Lake County, Indiana. The holotype of T. citatus is in the Drake Collection, U.S. National Museum.

Taxonomy.— This species has been greatly confused with other Trepobates in the literature and collections. Many references to T. pictus prior to 1926 undoubtedly refer to T. subnitidus. The confusion of T. subnitidus and inermis has been discussed in the taxonomy section for the latter species (see page 54). Froeschner (1962) placed some

Missouri females he examined under T. knighti because they had long connexival spines. This form is herein considered to be a morphological variant of T. subnitidus and is discussed below. T. citatus was described by Drake and Chapman (1953) based on specimens from Florida and Mississippi. The original description states that T. citatus differs from T. subnitidus in the following ways: (1) much darker in color; (2) antennal formula; (3) much shorter hairs on the middle femur in males; and (4) more robust form. The following observations are presented on the above differences between T. citatus and subnitidus: (1) specimens of T. citatus are much darker than most T. subnitidus examined, but some specimens of T. subnitidus from Connecticut, Illinois, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, and Rhode Island are as dark or darker than T. citatus; (2) while T. citatus has slightly longer antennae than T. subnitidus, the proportions of the antennal segments do not differ significantly; (3) male T. citatus have shorter hairs on the middle femur than do northern T. subnitidus, but male T. subnitidus from the southern United States (e.g. Texas, Mississippi, Georgia) also have shorter femoral hairs than do northern specimens; (4) T. citatus is larger and has longer legs than most T. subnitidus, but T. subnitidus from various parts of the range are as large or larger and with legs as long or longer than T. citatus. After examining over 6,000 specimens of T. subnitidus from all parts of its range and over 160 specimens identified as T. citatus, I believe that T. citatus

is synonymous with T. subnitidus. Even so, extensive field work on the ecology or life histories of Florida populations of T. subnitidus may eventually reveal that T. citatus is a valid species. T. subnitidus can be identified by the characters given in the keys and description.

Intraspecific Variation.— This species is extremely variable in color pattern (Figs. 111-116). The hairs on the middle femur are somewhat variable in length; these hairs are, at maximum length, approximately 60% of the diameter of the femur in southern populations and up to 100% of the diameter of the femur in northern populations. Females usually have a median patch of metanotal hairs, but this was variable even within a single population. Although the great majority of females studied did not have connexival spines (Fig. 118), some specimens had the connexiva slightly produced (Fig. 119) or with short or long spines (Figs. 120 and 121). The distribution map for T. subnitidus (Fig. 126) shows the occurrence of the different morphological variants. Two or sometimes three variants were occasionally collected from the same population. The winged form of T. subnitidus is most uncommon and represented only 7% of the specimens examined.

Natural History.— T. subnitidus is the most common species of Trepobates in the eastern United States and is often abundant. It is common on a wide variety of both lotic and lentic habitats. This species was commonly collected in association with T. knighti, Rheumatobates palosi, R. hunger-

fordi, R. tenuipes, Limnogonus hesione, and Gerris marginatus. It was occasionally collected with G. remigis, G. canaliculatus, R. rileyi, R. trulliger, T. pictus, T. taylori, and T. n. sp. 2. Although collected each month of the year except March, most records for this species are from May through October; all records from November through February are from the southern United States. During the present study, adults were collected while feeding on the following food items: a winged ant (Formicidae), a winged aphid (Aphididae), and an adult midge (Chironomidae). Specimens were taken in copula during the present study from June through October. Wilson (1958) reported that T. subnitidus mated from May through October in Mississippi. One adult collected in Little River County, Arkansas, had a mite on one of its eyes; an adult from Caddo Parish, Louisiana, had a mite on one of its wings; and two fifth instar nymphs from Johnston County, Oklahoma, had mites on the fore femur and mesopleuron. A specimen of Gerris remigis was observed feeding on an adult T. subnitidus in Washington County, Arkansas; it is not known whether the prey was dead or alive at the time of its capture by the Gerris. Life history information on this species is presented in a later section.

Distribution.— This species is known from the United States and Canada (Fig. 126) and probably occurs in Mexico just south of the Texas border.

Material Examined.— CANADA: Ontario: Essex Co.: Sept. 15, 1933, 2m, 3f (PU). Lincoln Co.: Jordan, Aug. 24, 1961, 1f (CNC).

UNITED STATES: Alabama: Bibb Co.: Cahaba R., 9 mi. N of Centerville, Oct. 14, 1971, 1f (INHS). Clay Co.: Cheuka Mt., June 5, 1947, 3f (FSCA). Dallas Co.: Marion Junction, July 16, 1930, 1m, 2f (UKL). Madison Co.: Huntsville, Aug. 20, 1968, 9f (JTP); lake, Huntsville, July 15, 1967, 10m, 9f (JTP). Montgomery Co.: Mt. Meigs, July 21, 1930, 1m (UKL). Sumter Co.: Coatopa, July 18, 1930, 4m, 3f (UKL). Arkansas: Ashley Co.: small stream, 6 mi. W of Fountain Hill, May 21, 1974, 1m, 3f (PDK). Benton Co.: Little Sugar Cr., 2 mi. NNW of Bella Vista, Oct. 1, 1975, 4m, 4f (PDK). Boone Co.: Crooked Cr., Harrison, Sept. 28, 1976, 1m, 1f (PDK). Calhoun Co.: stream, 1 mi. N of Hampton, May 23, 1974, 1f (PDK); borrow pit, 13 mi. S of Hampton, May 23, 1974, 3m, 3f (PDK). Clay Co.: Current R., 4 mi. NW of Success, Sept. 18, 1976, 2m, 1f (GLH). Cleburne Co.: Aug. 16, 1970, 1f (MSUM). Cleveland Co.: stream, 1 mi. N of Ivan, May 23, 1974, 2m, 3f (PDK). Craighead Co.: stock pond, Jonesboro, July 14, 1976, 2f, Sept. 3, 1976, 4m, 5f (GLH). Crawford Co.: Cold Springs L., 5.5 mi. N of Natural Dam, Aug. 27, 1972, 2m, 2f (PDK); L. Fort Smith, 2 mi. E of Chester, June 21, 1972, 7m, 9f (PDK); Hollis L., 5.5 mi. SE of Van Buren, May 20, 1972, 2m, 1f (PDK). Desha Co.: river, Aug. 30, 1967, 2m, 2f (UA). Faulkner Co.: L. Conway, 1.5 mi. N of Mayflower, June 17, 1975, 60m, 40f (PDK); L. Conway, 1.5 mi. E of Mayflower, May 23, 1974, 11m, 15f (PDK). Fulton Co.: South Fork Spring R., 1 mi. NE of Salem, Sept. 28, 1976, 21m, 17f (PDK). Greene Co.: Cache R., 4 mi. W of Light, Sept. 28, 1976, 1m (PDK).

Hempstead Co.: Bois d'Arc L., 4 mi. SW of Spring Hill, July 29, 1975, 6m, 7f (PDK); Bois d'Arc Cr., 7 mi. SW of Spring Hill, July 29, 1975, 6m, 1f (PDK). Jackson Co.: Village Cr. 2 mi. SW of Alicia, Oct. 9, 1976, 4m, 8f (GLH). Johnson Co.: Dirty Cr., 4 mi. N of Coal Hill, June 16, 1975, 12m, 14f (PDK). Lawrence Co.: Spring R., Imboden, Sept. 28, 1976, 2m, 2f (PDK). Little River Co.: Millwood Reservoir, 3 mi. N of Wilton, June 17, 1976, 10m, 21f (PDK). Logan Co.: Rock Cr., 3.5 mi. E of Abbott, June 17, 1976, 5m, 7f (PDK). Madison Co.: Kings R., 3.5 mi. E of Forum, Oct. 20, 1973, 1f (PDK); pond, 2.5 mi. WNW of Hindsville, June 27, 1972, 1m (PDK). Marion Co.: Crooked Cr., Pyatt, Sept. 28, 1976, 1m, 1f (PDK). Mississippi Co.: Mallard L., 1.5 mi. W of Roseland, Sept. 28, 1976, 85m, 42f (PDK); Left Hand Chute Cr., Roseland, Sept. 28, 1976, 1f (PDK). Pike Co.: Prairie Cr., 1.5 mi. SSE of Murfreesboro, July 29, 1975, 25m, 41f (PDK). Polk Co.: Six-mile Cr., 2 mi. NE of Cove, June 17, 1976, 10m, 9f (PDK). Pope Co.: L. Atkins, 2 mi. S of Atkins, May 23, 1974, 43m, 58f (PDK). Randolph Co.: Fourche Cr., 6 mi. N of Pocahontas, Sept. 17, 1976, 1m, 1f (GLH); farm pond, 7 mi. E of Warm Springs, Oct. 2, 1976, 2m, 1f (GLH). Saline Co.: open-pit lake, 4.5 mi. SE of Bryant, June 20, 1970, 3f (GLH); open-pit lake, 3 mi. S of Benton, May 23, 1970, 2m, 4f (GLH). Scott Co.: lake, 4 mi. S of Waldron, June 17, 1976, 21m, 63f (PDK). Sevier Co.: Little Cossatot R., 5.5 mi. N of Lockesburg, June 17, 1976, 21m, 16f (PDK). Sharp Co.: stream, 2 mi. N of Willi-

ford, Sept. 28, 1976, 2m, 3f (PDK). Union Co.: pond, 5 mi. E of Strong, May 22, 1974, 1m, 3f (PDK); borrow pit, 3 mi. NE of Junction City, May 20, 1974, 1m (PDK). Washington Co.: White R., 5 mi. E of Fayetteville, Aug. 20, 1976, 71m, 70f (PDK); ornamental pool, Fayetteville, Nov. 1, 1975, 1f (PDK); White R., 5 mi. E of Fayetteville, Aug. 29, 1975, 92m, 39f, Sept. 15, 1972, 10m, 12f (PDK); stock pond, 2 mi. S of Wheeler, May 23, 1975, 2m, 3f, Aug. 31, 1975, 1m, 2f (PDK); Wildcat Cr., 2 mi. W of Harmon, Aug. 31, 1975, 1f, Sept. 12, 1973, 2m, 6f (PDK); Clear Cr., 5.5 mi. NW of Fayetteville, Oct. 22, 1973, 1f (PDK); Farmington Branch, Farmington, Oct. 15, 1972, 1m (PDK); Muddy Fork Cr., 3 mi. NW of Prairie Grove, Oct. 15, 1972, 2m, 2f (PDK); small stream, 2 mi. ENE of Rhea, Oct. 15, 1972, 1f (PDK); Illinois R., 4 mi. W of Farmington, Oct. 15, 1972, 1m, 1f (PDK); Cincinnati Cr., 1 mi. ESE of Cincinnati, Oct. 13, 1972, 1m, 1f (PDK); stock pond, 0.5 mi. S of Summers, Oct. 13, 1972, 4m, 8f (PDK); Ballard Cr., 1 mi. NW of Summers, Oct. 13, 1972, 1f (PDK); Barren Fork Cr., 2 mi. E of Dutch Mills, Oct. 2, 1972, 1m (PDK); L. Lincoln, 4 mi. N of Lincoln, Oct. 2, 1972, 2m, 2f (PDK); Illinois R., 3 mi. E of Prairie Grove, Oct. 2, 1972, 1m (PDK); stock pond, 4 mi. E of Winslow, Sept. 30, 1972, 3m, 5f (PDK); Ellis Branch, 5 mi. SSE of Strickler, Sept. 30, 1972, 1m, 1f (PDK); White R., 4.5 mi. E of Fayetteville, Sept. 15, 1972, 2m, 1f (PDK); pond, 2 mi. E of Fayetteville, Sept. 15, 1972, 4m, 7f (PDK); pond, 2 mi. NE of Fayetteville, Sept. 15, 1972, 12m, 5f (PDK); Beaver Reservoir, 3 mi. NW of

Spring Valley, Sept. 9, 1972, 28m, 9f (PDK); War Eagle Cr., 4 mi. NE of Spring Valley, Sept. 9, 1972, 2m, 2f (PDK); pond, 4 mi. NE of Sonora, Sept. 9, 1972, 2m, 7f (PDK); Beaver Reservoir, 2.5 mi. E of Sonora, Sept. 9, 1972, 1m, 3f (PDK); pond, Springdale, Sept. 9, 1972, 2m, 4f (PDK); pond, 2 mi. S of Wheeler, Sept. 6, 1972, 9m, 10f (PDK); stock pond, 3 mi. W of Tontitown, Sept. 6, 1972, 37m, 27f (PDK); Clear Cr., Johnson, July 11, 1976, 7m, 11f, Sept. 6, 1972, 2m, 3f (PDK); Illinois R., 4.5 mi. SE of Prairie Grove, Aug. 27, 1972, 1f (PDK); spring-fed pond, 12 mi. W of Fayetteville, Aug. 21, 1972, 7m, 2f, Oct. 13, 1973, 1m, 1f (PDK); L. Wedington, 12 mi. W of Fayetteville, Aug. 21, 1972, 5m, 8f (PDK); Illinois R., 4.5 mi. W of Farmington, Aug. 21, 1972, 1m (PDK); Mill Branch, Goshen, Aug. 16, 1972, 1f (PDK); Cave Cr., 2 mi. SE of Goshen, Aug. 16, 1972, 1m (PDK); East Fork White R., Elkins, Aug. 16, 1972, 1f (PDK); Tuttle Branch, 3 mi. E of Elkins, Aug. 16, 1972, 7m (PDK); stock pond, 4 mi. SW of Elkins, Aug. 16, 1972, 7m, 4f (PDK); Middle Fork White R., 1 mi. WNW of Sulphur City, Aug. 16, 1972, 1f (PDK); Ballard Cr., 0.5 mi. W of Summers, July 18, 1972, 1m, 3f (PDK); stock pond, 4 mi. N of Summers, July 18, 1972, 3m, 4f (PDK); stock pond, 4.5 mi. N of Summers, July 18, 1972, 1f (PDK); small stream, 2 mi. ESE of Fayetteville, June 19, 1972, 3m, 6f (PDK); West Fork White R., 3.5 mi. SE of Fayetteville, June 19, 1972, 2f, Aug. 16, 1972, 1f (PDK); Middle Fork White R., 3.5 mi. WNW of Elkins, June 19, 1972, 6m, 15f (PDK); Clear Cr., 2 mi. W of Johnson, June 16, 1972,

1m, 3f (PDK); Barren Fork Cr., Dutch Mills, May 31, 1972, 5f (PDK); spring-fed pond, 4 mi. SW of Springdale, Sept. 6, 1972, 10m, 6f (PDK); L. Elmdale, 1.5 mi. SE of Elm Springs, Sept. 6, 1972, 4f (PDK); L. Sequoyah, 6 mi. E of Fayetteville, Sept. 15, 1972, 3m, 5f (PDK); L. Fayetteville, 3 mi. E of Johnson, May 25, 1972, 2m, 5f, June 24, 1975, 20m, 4lf, Oct. 20, 1975, 2m, 2f, Oct. 25, 1972, 3m, 2f (PDK); Hog Heaven L., 1.5 mi. E of Johnson, Oct. 18, 1972, 2m, 4f (PDK); West Fork White R., 6 mi. N of Winslow, June 9, 1972, 2m, 2f (PDK); Beaver Reservoir, 1.5 mi. SSE of Sonora, June 6, 1972, 16m, 6f (PDK); West Fork White R., 3 mi. SSE of West Fork, June 9, 1972, 1f (PDK). Connecticut: Litchfield Co.: Lakeville, Aug. 25, 1934, 1f (UMAA). Tolland Co.: Fenton R., Storrs, Oct. 3, 1965, 1m (UCS). District of Columbia: Oct. 13, 1f (USNM). Florida: Citrus Co.: Homosassa Springs, July 5, 1953, 1m, 2f (UMAA), 1m (FSCA), Oct. 19, 1952, 1m (UMAA), Nov. 15, 1952, 2f (UMAA). Franklin Co.: Apalachicola R., June 4, 1955, 1f (FSCA). Lake Co.: Alexander Spring, Astor, Feb. 5, 1968, 5m, 3f (JTP). Marion Co.: Rainbow R., Aug. 4, 1946, 1m (FSCA); Ocala, April 14, 1950, 2m, 2f (USNM). Orange Co.: L. Jessamine, Aug. 16, 1952, 2m, 1f (USNM); Sylvan L., Aug. 19, 1952, 1m, 9f (USNM); Winter Park, May 10, 1952, 7m, 2f (USNM); Wekiwa Springs, Apopka, Feb. 15, 1966, 20m, 24f (JTP); Apopka, March 13, 1952, 1f (HCC), June 19, 1952, 1m (USNM), July 4, 1952, 2f (JTP), 1f (HCC), July 8, 1952, 1m (JTP), 1m (HCC), July 19, 1952, 4m, 1f (USNM), 3m, 2f (HCC), 1m, 1f (CAS), 1f (AMNH),

Nov. 6, 1952, 4m, 1f (USNM), 1m (UMAA), 1f (AMNH), Nov. 10-11, 1952, 12m, 10f (USNM), 2m, 1f (FSCA), 1m, 1f (FMNH), 1m, 1f (LACM), 1m, 1f (CNC), 2f (HCC), 1m (AMNH), 1m (UKL), 1f (UMAA), Dec. 17, 1952, 4m, 5f (USNM), 1m (JTP), 1f (HCC), 1f (AMNH). Volusia Co.: Osteen, Aug. 6, 1952, 1m, 2f (USNM); Deleon Spring, DeLand, Oct. 28, 1965, 7m, 4f (JTP), 1f (CSU), 1f (OU); Blue Spring, DeLand, Oct. 28, 1965, 2m, 1f (OU), 1m, 2f (AMNH), 2m (JTP), Dec. 14, 1963, 4m, 8f (JTP), 1m, 1f (UKL), 2m, 1f (CSU). Georgia: Baker Co.: pond, 9.4 mi. W of Damascus, Aug. 22, 1975, 2m (UG). Camden Co.: estuary, 2 mi. E of St. Marys, Aug. 15, 1975, 1m, 2f (PDK). Clarke Co.: Bear Cr., 2.5 mi. NE of Bogart, Aug. 19, 1972, 1m, Aug. 26, 1972, 3m, 1f, Oct. 5, 1975, 5m, 6f (UG); Sandy Cr., 5.3 mi. N of Athens, Oct. 7, 1972, 2f (UG); Sandy Cr., 2 mi. N of Athens, Aug. 3, 1973, 7m, Aug. 21, 1975, 5m, 4f (UG); Middle Oconee R., Mitchell Br. Pk., Oct. 10, 1971, 1f (UG); pond, 1.5 mi. SE of Bogart, Aug. 26, 1973, 6m, 7f, Nov. 20, 1972, 3f (UG); pond, Russell Res. Cent., Sept. 3, 1974, 7m, 18f (UG); Ben Burton City Pk., July 1, 1974, 2m (UG). Early Co.: Weaver Cr., 2.4 mi. ESE of Hilton, Aug. 23, 1975, 1f (UG). Fannin Co.: Morganton, Sept. 8, 1944, 2m, 1f (UCB). Fulton Co.: Robertson L., May 31, 1965, 4f (USNM). Heard Co.: Chattahoochee R., June 21, 1965, 1m (FAMU). Madison Co.: Aug. 15, 1971, 1m, 1f (UG). Marion Co.: Harbuck's Pond, Buena Vista, Aug. 5, 1946, 1f (USNM). Meriwether Co.: Warm Springs, July 17, 1913, 2m, 2f (CU), 2m (UCB). Monroe Co.: Rum Cr. and Ga. 18, Nov. 3, 1972, 1m, 1f (UG). Oconee

Co.: Dekalb Farm, July 7, 1971, 1f, July 18, 1971, 2m, 4f, Aug. 13, 1971, 2m, 2f (UG). Oglethorpe Co.: Echol's Mill, Aug. 16, 1973, 13m, 11f (UG). County unknown: Victory Pond, Ft. Benning, Aug. 1, 1943, 5m, 3f (USNM). Illinois: Alexander Co.: Horseshoe L., 3 mi. SE of Olive Branch, Sept. 27, 1976, 5m, 6f (PDK). Cass Co.: Beardstown, June 20, 1956, 3m (JTP). Champaign Co.: Urbana, July 24, 1955, 2f (SIU), Aug. 29-31, 1893, 3m, 5f (INHS). Cook Co.: July 11, 1956, 1f (JTP); swamp, Oakton, Aug. 15, 1905, 2f (INHS), 1m, 1f (LSU). Cumberland Co.: stock pond, Neoga, Sept. 15, 1943, 1m (INHS). Fulton Co.: W of Havana, Sept. 10, 1894, 1f (INHS); Flag L., W of Havana, July 20, 1897, 1f (INHS); Phelp's L., W of Havana, June 25, 1894, 2m, 2f (INHS). Gallatin Co.: Ridgeway, June 17, 1956, 1f (JTP). Greene Co.: Apple Cr., 9 mi. N of Greenfield, Sept. 26, 1976, 1m, 2f (PDK); Macoupin Cr., 1 mi. SE of Rockbridge, Sept. 26, 1976, 14m, 12f (PDK). Jackson Co.: L. Murphysboro, 5 mi. WNW of Murphysboro, Sept. 25, 1976, 7m, 6f (PDK); Carbon-dale, May 4, 1963, 1f, July 30, 1973, 1f (SIU). Marshall Co.: Henry, Aug. 1, 1956, 1f (JTP). Mason Co.: Illinois R., near Havana, July 6, 1895, 1m (INHS); Quiver Cr., June 15-16, 1894, 2f (INHS); Quiver L., July 29, 1894, 2m, 5f, Aug. 13, 1894, 1m, 2f (INHS); Havana, June 24, 1910, 4f, June 27, 1910, 17m, 15f, July 7, 1910, 1f, July 13, 1910, 2m, 3f (INHS). Massac Co.: Choat, July 17, 1956, 7f (JTP). Perry Co.: strip mine lake, 5 mi. SSW of Pinckneyville, Sept. 25, 1976, 1m, 2f (PDK). Pike Co.: stream, Pearl,

Sept. 26, 1976, 5m, 5f (PDK). Randolph Co.: Nine-mile Cr., 2 mi. N of Ellis Grove, Sept. 25, 1976, 10m, 11f (PDK). Rock Island Co.: Milan, Aug. 14, 1956, 1m (AMNH). Schuyler Co.: Long Lake, June 20, 1956, 4f (JTP). Shelby Co.: S of Stewardson, June 26, 1956, 3f (JTP). Tazewell Co.: Farm Cr., East Peoria, Aug. 29, 1910, 1f (INHS). Union Co.: stream, 2 mi. WNW of Jonesboro, Sept. 25, 1976, 2m, 4f (PDK). Vermilion Co.: Rossville, July 10, 1956, 2f (OU), 1f (AMNH). Washington Co.: Little Muddy R., Du Bois, Nov. 9, 1894, 1f (INHS). Williamson Co.: Crab Orchard L., 5 mi. WSW of Marion, Sept. 25, 1976, 2m, 2f (PDK). County unknown: Spoon R., Aug. 22, 1895, 3f (INHS). Indiana: Brown Co.: July 9, 1961, 1f (TAMU), Oct. 2, 1938, 1f (PU). Carroll Co.: July 14, 1935, 1f, July 15, 1934, 1m, 1f, July 28, 1934, 1m, 1f, Sept. 16, 1934, 1m, 1f (PU). Dubois Co.: Sept. 11, 1932, 1m, 1f (PU). Fulton Co.: July 20, 1936, 1m, 1f (PU). Grant Co.: July 11, 1933, 1m, 1f (PU). Harrison Co.: July 7, 1934, 1m, 1f (PU). Jennings Co.: Oct. 15, 1932, 3f (PU). Johnson Co.: Oct. 15, 1932, 1f (PU). Kosciusko Co.: July 4, 1932, 2m, 4f (PU), 1m, 1f (UKL), July 20, 1932, 1f, Aug. 7, 1932, 1f, Aug. 10, 1933, 1m, Sept. 10, 1933, 1m (PU). Lake Co.: Clarke Junction, July 4, 1904, 1f (syntype) (HNHM), 2f (CAS), 1m (FMNH), 1f (UMAA), 1f (LACM), 1m (USNM), Aug. 7, 1904, 2f (FMNH), 1f (LACM), 1f (USNM). Lawrence Co.: Bedford, 1f (PU). Marion Co.: Sept. 1, 1928, 1m, Sept. 23, 1924, 1f (PU). Monroe Co.: July 14, 1961, 1m (JTP), 1f (TAMU). Parke Co.: Sept.

29, 1934, 1f (PU). Tippecanoe Co.: July 4, 1938, 1m (PU); 5 mi. N of Lafayette, Sept. 11, 1973, 4m (UG). Whitley Co.: Aug. 17, 1932, 1m (PU). Iowa: Blackhawk Co.: Cedar Falls, July 26, 1927, 1f (ISU), 1f (UI), 1m (LSU). Cass Co.: Atlantic, July 23, 1927, 1f (TAMU). Clinton Co.: Clinton, Aug. 18, 1942, 4m, 3f (ISU). Delaware Co.: Aug. 31, 1942, 2m, 3f (ISU). Des Moines Co.: Burlington, Aug. 4, 1926, 6f (LSU), 2m, 1f (ISU), 1f (CAS). Henry Co.: Mt. Pleasant, July 14, 1927, 1f (MSU). Jackson Co.: Green Island, Aug. 18, 1942, 3m, 1f (ISU). Louisa Co.: Wapello, Aug. 5, 1926, 1m, 1f (ISU). Page Co.: Clarinda, Sept. 10, 1942, 5m, 14f (ISU), 1f (LSU). Ringgold Co.: Mt. Ayr, Sept. 10, 1942, 2m, 2f (ISU). Story Co.: Ames, July, 1925, 1f (ISU), July 9, 1928, 1m (CAS), July 10, 1945, 4m, 4f (JTP), 2m, 2f (UKL), 2m, 1f (USNM), 1m, 1f (AMNH), 1m (CU), July 15, 1945, 1m (USNM), 1f (JTP), 1m (TAMU), 1m (UCB), July 15, 1931, 1m (LSU), July 28, 1945, 2f (USNM), 1f (BMNH), July 28, 1946, 4m, 5f (UCS), 2m, 1f (USNM), 1m, 1f (OU), 2m (JTP), 1f (HCC), 1f (CU), July 29, 1924, 3m, 1f (UBC), 3f (USNM), 3m (ISU), 1m, 1f (INHS), 1m (CAS), 1m (FSCA), Aug. 1, 1924, 1f (LSU), Aug. 3, 1925, 1m, 1f (LSU), 1m (ISU), Aug. 7, 1945, 1f (JTP), 1f (ISU). Taylor Co.: Bedford, Sept. 10, 1942, 7m, 9f (ISU), 1f (LSU). Union Co.: Thayer, Sept. 10, 1942, 1f (ISU). Van Buren Co.: Lacey Keosauqua St. Pk., Sept. 10, 1949, 1f (UCS). County unknown: Napier, July 7, 1945, 3m, 1f (ISU). Kansas: Allen Co.: Sept. 20, 1932, 1f (PU). Cherokee Co.: Aug. 15, 1920, 1m, 8f (UKL). Doniphan Co.:

July 22, 1924, 4m, Aug. 23, 1921, 3m, 8f (UKL). Douglas Co.: 3m, 11f (UKL); Potter L., Aug. 16, 1964, 4f (USNM); Dykeman's Bridge, July, 1922, 12m, 13f (UKL), 3f (USNM). Hodgeman Co.: July 17-25, 1917, 11m, 15f (UKL). Kiowa Co.: July 5, 1923, 5m, 4f (UKL), 1m (INHS). Leavenworth Co.: July 12, 1924, 1m (UKL). Marion Co.: Florence, Sept. 4, 1922, 3f (UMSP); Cedar Cr., 2 mi. SW of Cedar Point, Sept. 4, 1922, 5f (UMSP). Montgomery Co.: Elk City, 1m (UKL). Neosho Co.: 1f (USNM); Sept. 20, 1932, 2m, 1f (PU), Oct. 18, 1922, 2m, 2f (UMSP); Big Turkey Cr., Chanute, Sept. 24-25, 1922, 65m, 35f (UMSP). Riley Co.: 1m (LSU); Aug. 3, 1m, 1f, Sept. 4, 1f (KSU); Manhattan, Sept. 13, 1923, 1f (UKL). County unknown: Modesha, Aug. 25, 1950, 1f (USNM). Kentucky: Crittenden Co.: Sept. 11, 1932, 1m, 1f (PU). Franklin Co.: Frankfort, Sept. 16, 1921, 1m, 1f (UK). Hancock Co.: Yellow Cr., 1.5 mi. SE of Lewisport, Oct. 25, 1973, 1f (INHS). Hickman Co.: stream, 3 mi. S of Columbus, Sept. 27, 1976, 20m, 7f (PDK). McCracken Co.: Sept. 13, 1932, 1m, 1f (UKL). Oldham Co.: Floyds Fork, 2 mi. SSE of Ballardsville, Oct. 26, 1973, 1m, 1f (INHS). Union Co.: Sept. 11, 1932, 1m, 1f (PU). Louisiana: Allen Par.: Calcasieu R., 4 mi. W of Kinder, May 22, 1976, 2m, 4f (JTP). Beauregard Par.: Bundicks L., Sept. 17, 1968, 3m, 2f (HCC). Caddo Par.: Black Bayou, 1 mi. W of Hosston, June 17, 1976, 3m, 2f (PDK); Black Bayou L., 1 mi. W of Hosston, June 17, 1976, 24m, 20f (PDK). East Baton Rouge Par.: Baker, Aug. 30, 1934, 3m (LSU), 1m (ISU); Baton Rouge, Aug. 27, 1930,

1m, 2f (ISU). Orleans Par.: New Orleans, Oct. 30, 1944, 6f (UKL). Pointe Coupee Par.: Torras, Aug. 8, 1906, 14m, 5f (UKL). St. Charles Par.: Bonnet Carre spillway, Norco, Oct. 14, 1944, 49m, 6f (UKL). St. Tammany Par.: English Bayou, June 8, 1965, 1m (CAS); Slidell, July 5, 1906, 4m, 3f (UKL), Sept. 14, 1930, 1m, 2f (ISU), 1f (CAS). Vernon Par.: Wildcat L., Anacoco, July 5, 1952, 4m, 1f (JTP), 1m, 1f (CSU), 1f (UCB), 1f (TAMU). Maine: Washington Co.: Roque Bluffs, Aug. 15, 1907, 1m (CAS). Maryland: Anne Arundel Co.: South R., 4 mi. S of Annapolis, July 31, 1932, 6m, 7f (UKL); Bay Ridge, Aug. 20, 1903, 2f (CU), 1f (AMNH). Montgomery Co.: near Plummers Island, July 26, 1914, 1m (USNM); Great Falls, June 28, 1963, 3m (CAS); Glen Echo, June 10, 1893, 1f (UKL), June 13, 1897, 1f (CU), June 26, 1893, 1m (USNM), 1f (ISU), July 23, 1893, 1f (UKL), July 26, 1894, 1m (UKL), 1f (CU), Sept. 1, 4f (USNM), Sept. 4, 1893, 1f (UKL), Oct. 8, 1893, 1m (CU). Prince Georges Co.: Camp Springs, Sept. 9, 1959, 1m (OSUC). Massachusetts: Hampden Co.: Agawam, Sept. 5, 1899, 1f (CU). Middlesex Co.: Winchester, Sept. 12, 1907, 2m, 7f (CAS). Michigan: Clinton Co.: Bath, Sept. 23, 1964, 1m (SIU). Lake Co.: L. Olga, Sept. 10, 1952, 1m (UMAA). Livingston Co.: Lakeland, Aug. 10, 1919, 1f (UMAA), 1m (USNM). Monroe Co.: Sept. 14, 1933, 1f (PU). Washtenaw Co.: Sept. 6, 1918, 1m, 3f (UMAA), 1f (FSCA); Caran L., Sept. 6, 1918, 1m (USNM); Ann Arbor, Aug. 9, 1922, 1f (UMAA). Minnesota: Clearwater Co.: Itasca St. Pk., Aug. 31, 1970, 2m, 1f, Sept. 2, 1970, 3m, 3f

(SCSC). Crow Wing Co.: Pleasant L., near Cross Lake, Sept. 5, 1976, 8m, 8f (SCSC). Hennepin Co.: Minneapolis, Oct. 2, 1924, 2f (UMSP). LeSueur Co.: Sept. 10, 1923, 1f (UMSP); creek, 3.5 mi. SE of LeSueur, Sept. 13, 1923, 1m (UMSP); Spring L., Aug. 26, 1923, 1m, 5f (UMSP), 1m, 1f (MSUB), Sept. 7, 1923, 22m, 20f (UMSP); L. Emily, July 25, 1923, 1f (UMSP). St. Louis Co.: lake, Ely, Aug. 21, 1940, 2m, 2f (UKL), 1m (UCS). Stearns Co.: Twin Ponds, St. Cloud, Sept. 27, 1976, 1m, 2f (SCSC). Swift Co.: Benson, Aug. 23, 1922, 2f (UMSP). Mississippi: Adams Co.: Natchez, Sept. 8, 1924, 1m (ISU); Washington, Sept. 16, 1924, 2m (MSU), 1f (ISU), 1f (LSU). Bolivar Co.: Beulah, Oct. 30, 1948, 3m, 7f (MSU); Scott, Oct. 30, 1948, 3m, 2f (MSU); Cleveland, Oct. 30, 1948, 2m, 3f (MSU). Clarke Co.: Clarckco St. Pk., Sept. 14, 1973, 4m, 2f (UG). Forrest Co.: Black Cr., 4 mi. SE of Hwy. 59, Sept. 3, 1972, 1f (FAMU). Grenada Co.: White L., Sept. 14, 1926, 2m, 3f (ISU), 2m, 2f (LSU), 1m (CAS), 1m (MSU). Harrison Co.: Biloxi, April 22, 1949, 7m, 5f, May 1, 1949, 2m, 2f, Sept. 3, 1950, 1m, 1f (MSU), Sept. 25, 1949, 1f, Oct. 9, 1949, 1f (JTP). Jackson Co.: Pritchard's Landing Swamp, Pascagoula, Aug. 11, 1958, 1m, 1f (JTP); borrow pit, 5 mi. W of Vancleave, Aug. 22, 1973, 13m, 9f (PDK); bayou, Ocean Springs, Aug. 11, 1973, 3m, 6f (PDK); pond, Ocean Springs, July 21, 1973, 12m, 23f (PDK). Jasper Co.: Heidelberg, Sept. 5, 1924, 3m, 1f (ISU), 2f (LSU), 1m (CAS). Jefferson Co.: Fayette, Sept. 10, 1924, 2m (ISU), 1m (TAMU), 1m (MSU). Jones Co.: Laurel, Aug. 27, 1934, 2m,

2f (LSU), 1m (ISU), Sept. 6, 1924, 1m (MSU). Kemper Co.: Scooba, July 17, 1930, 1m, 1f (UKL). Leake Co.: Carthage, Aug. 21, 1928, 1f (ISU). Leflore Co.: Itta Bena, Oct. 16, 1948, 4f (MSU); Greenwood, Oct. 16, 1948, 6m, 14f (MSU). Lowndes Co.: Columbus, Oct. 2, 1948, 1f (MSU). Monroe Co.: Hamilton, July 15, 1930, 2f (UKL). Oktibbeha Co.: State College, May 25, 1949, 9m, 5f, Sept., 1896, 1m, Sept. 18, 1948, 3m (MSU), Nov. 1895, 3m (CSU), 1f (MSU); Starkville, Sept. 25, 1948, 8m, 5f, Oct. 2, 1948, 2m, 3f (MSU). Stone Co.: Wiggins, Aug. 15, 1936, 3m, 1f (ISU), 2m, 2f (LSU). Tallahatchie Co.: Charleston, July 22, 1949, 2m, 2f (LSU), Aug. 20, 1930, 13m, 8f (ISU), 1m (WSU), Sept., 1928, 6m, 1f (ISU), 1f (WSU), Sept. 4, 1934, 32m, 19f (ISU), 2m, 1f (LSU), Sept. 8, 1926, 4m (LSU), 1m, 1f (MSU), 1m (ISU), 1m (UI), Sept. 9, 1925, 1f (LSU). Warren Co.: Vicksburg, July 19, 1921, 2m (ISU), 1m (UBC). Washington Co.: Stoneville, Oct. 31, 1948, 2f (MSU); Glen Allan, Oct. 31, 1948, 5m, 6f (MSU). Webster Co.: Eupora, Oct. 16, 1948, 5m, 1f (MSU). Wilkinson Co.: Woodville, Aug. 9, 1921, 1f (USNM).

Missouri: Audrain Co.: 3 mi. SSE of Santa Fe, Sept. 22, 1973, 1f (INHS); 2 mi. N of Molino, Sept. 22, 1973, 1m, 3f (INHS). Barry Co.: Roaring R., Eagle Rock, Sept. 2, 1973, 4m, 6f (PDK). Boone Co.: Ashland Wildlife Area, Sept. 11, 1968, 1f, Oct. 7, 1976, 1f (UMC); Ashland, Aug. 31, 1974, 1m (UMC); Hunter's Cave area, Aug. 16, 1976, 1f (UMC); Columbia, Aug., 1965, 1f (UMC); 6 mi. S of Columbia, Aug. 4, 1953, 3f (USNM), 1f (UKL), 1f (UMC). Carter Co.: Van Buren, June

13, 1930, 1f (UMAA). Dallas Co.: Niangua R., 1 mi. SW of Bennett Springs, Aug. 31, 1974, 2m, 1f (PDK). Franklin Co.: Meramec R., 3 mi. S of Stanton, Sept. 1, 1974, 1f (PDK). Jasper Co.: stream, Sarcoxie, Sept. 24, 1976, 1m, 3f (PDK). Jefferson Co.: stream, 4 mi. S of Festus, Sept. 27, 1976, 2f (PDK). Laclede Co.: Gasconade R., 1 mi. W of Hazelgreen, Sept. 24, 1976, 6m, 6f (PDK). MacDonald Co.: stream, 2 mi. SE of Pineville, Sept. 24, 1976, 4m, 9f (PDK). Newton Co.: Cedar Cr., 7 mi. N of Neosho, Sept. 22, 1973, 18m, 21f (PDK). Phelps Co.: stream, 2 mi. SSW of Jerome, Sept. 24, 1976, 7m, 7f (PDK). St. Louis Co.: Howard Bend, June 28, 1937, 5f (LSU), 2m, 3f (CU), 1m (USNM). Shannon Co.: pond, 1.5 mi. E of Winona, Sept. 2, 1974, 7m, 7f (PDK). Taney Co.: Taney Como Reservoir, Hollister, July 5, 1974, 2m, 8f (PDK). Nebraska: Lancaster Co.: Wagon Train L., Aug. 10, 1969, 6m, 8f (UI). New Hampshire: Strafford Co.: Durham, Oct. 5, 1924, 1m, 1f (UNH). New Jersey: Cape May Co.: Tuckahoe, May 22, 1954, 1f (USNM), 1m (HCC), June 25-26, 1954, 8m, 4f (HCC), 3m, 6f (USNM), July 16, 1954, 6m, 2f (USNM), 3m, 2f (HCC), Aug. 4, 1953, 1f (HCC), Sept. 6, 1953, 1m (HCC); 1 mi. W of Rio Grande, July 30, 1972, 1m, 2f (UG). Mercer Co.: Hightstown, Aug. 28, 1957, 3m, 2f (HCC). Middlesex Co.: Jamesburg, Sept. 9, 1957, 5m, 5f (HCC); New Brunswick, Sept. 2, 1957, 3m, 2f (HCC), 1f (JTP), Sept. 5, 1957, 1f (HCC), Sept. 16, 1957, 14m, 13f (USNM), 1f (BMNH), Oct. 15, 1957, 4m, 5f (HCC). Monmouth Co.: Millhurst, Sept. 27, 1957, 6m, 4f (HCC). Morris Co.:

Millington, Oct. 9, 1957, 1f (JTP); Morris Plains, Oct. 1, 1960, 1m, 1f (RU). Somerset Co.: pond, Basking Ridge, Sept. 15, 1968, 3m, 2f (JTP); Lyons, Oct. 9, 1957, 1m, 4f (HCC), 1m (JTP); Watchung, Oct. 9, 1957, 4m, 4f (HCC), 1f (USNM), 1m (JTP), 1f (FSCA). New Mexico: Eddy Co.: Carlsbad, Aug. 27, 1934, 1f (USNM). New York: Erie Co.: Hamburg, Sept. 14, 1906, 1f (CAS). Queens Co.: Bayside, July 7, 1941, 1f (USNM); Queens Village, Aug. 31, 1938, 1f (USNM); Flushing, Sept. 13, 1910, 2m (LSU), 1f (CU). Suffolk Co.: Cold Spring Harbor, July 27, 1920, 2f, Aug. 13, 1920, 1f, Aug. 17, 1919, 4m, 9f (CAS). Westchester Co.: White Plains, 1m, 3f (BMNH), June 20, 1908, 1f, July 4, 1908, 1m, 2f, July 4, 1917, 2f, July 11, 1908, 1f, July 29, 1908, 3f, Aug. 3, 1908, 1m, Aug. 10, 1921, 1f (UKL), Sept. 21, 1907, 1f (CAS). County unknown: L. Waccabuc, July 10, 1931, 1m, 3f, Aug. 8, 1931, 1f (UKL). North Carolina: Haywood Co.: Waynesville, Aug. 25, 1954, 2f (FSCA). Mecklenburg Co.: pond, Charlotte, Sept. 9, 1974, 12m, 8f (UG). Moore Co.: pond, 1.7 mi. E of Biscoe, July 29, 1975, 3m, 3f (UG). Transylvania Co.: stream, 6 mi. SW of Oakland, 2m, 1f (PDK). Wake Co.: Raleigh, Aug. 5, 1905, 1m, 1f (UKL). Ohio: Butler Co.: Oxford, Sept. 26, 1952, 1m, Oct. 17, 1963, 1m (MUO). Fairfield Co.: Sugar Grove, July 24, 1916, 1f (INHS). Franklin Co.: Columbus, Aug. 15, 1916, 1f (CAS), Sept. 10, 1916, 1m (UNH), Sept. 26, 1914, 1f (CAS), Oct. 9, 1913, 1m (OSU), Oct. 19, 1913, 1m (CAS); Mirror L., Columbus, June 28, 1919, 1f, July 26, 1919, 1m, 1f, Aug. 23, 1919, 1f, Sept. 8, 1919,

1m (OSU). Geauga Co.: Grand R., 2 mi. SE of Parkman, Sept. 16, 1973, 1m (PDK). Licking Co.: Cranberry Marsh, Buckeye Lake, July 9, 1920, 2f (OSU); Buckeye Lake, Sept. 14, 1913, 1m, 1f (OSU). Logan Co.: Indian L., July 19, 1920, 1m, 1f (OSU); Dunn's Pond, July 19, 1920, 1m, 2f (OSU). Medina Co.: Chippewa L., Aug. 19, 1922, 2m, 1f (OSU). Mercer Co.: July 26, 1919, 1m, 1f, Sept. 3, 1918, 1f (UMAA). Montgomery Co.: Miami R., Taylorsville, Aug. 26, 1976, 1f (DMNH). Paulding Co.: Aug. 14, 1932, 1m, 1f (UKL), 1m, 1f (PU). Perry Co.: Shawnee, Sept. 2, 1968, 1m, 2f (UMC). Pike Co.: Benton Twp., Aug. 28, 1976, 6m, 8f (DMNH); Pike L., Pike Lake St. Pk., Aug. 28, 1976, 5m, 22f (DMNH). Shelby Co.: Loramie L., July 22-24, 1920, 1m, 4f (OSU). Summit Co.: Ira, Aug. 30-31, 1916, 1f (ISU), 1f (USNM). Trumbull Co.: Grand R., 1 mi. W of West Farmington, Sept. 17, 1973, 1m (PDK); pond, 3 mi. SE of Southington, July 25, 1972, 1m, 4f, Aug. 14, 1975, 16m, 21f, Aug. 28, 1975, 6m, 9f, Sept. 7, 1976, 3m, 7f (PDK); Dead Branch, 2 mi. N of Southington, Sept. 6, 1976, 7m, 18f (PDK); farm pond, 3 mi. N of Southington, Sept. 6, 1976, 1m, 2f (PDK); Swine Cr., 1.5 mi. NW of West Farmington, Sept. 7, 1976, 1m, 1f (PDK); pond, East Farmington, Sept. 17, 1973, 2m, 11f (PDK); Mosquito L., 2 mi. W of Cortland, Oct. 3, 1973, 2m, 1f (PDK). Warren Co.: Spring Valley L., Sept. 1, 1976, 1m (DMNH). Oklahoma: Adair Co.: L. Francis, 2.5 mi. NE of Watts, Oct. 13, 1972, 1f (PDK); small stream, 4 mi. E of Stilwell, May 31, 1972, 1m (PDK). Blaine Co.: Roman Nose St. Pk., Sept. 27, 1975,

2m, 1f (UO). Carter Co.: Ardmore, July 5, 1963, 1m, 2f (OSUS), Oct. 21, 1920, 2m, 3f (UKL). Cleveland Co.: Sept. 27, 1947, 2f, Oct. 10, 1947, 1f, Nov. 2, 1948, 2f, Nov. 4, 1947, 1f, Nov. 25, 1947, 1m (UO); Noble Ponds, Sept. 12, 1975, 2m (UO). Delaware Co.: stock pond, 3 mi. W of Leach, May 28, 1976, 1f (PDK); Flint, July 23, 1963, 1f (OSUS). Jefferson Co.: N of Ringling, July 5, 1963, 14m, 11f (OSUS). Johnston Co.: Schaeffer Pond, 1 mi. N of Ravia, May 24, 1975, 1m, May 26, 1975, 1m, 2f, June 25, 1975, 14m, 21f (PDK); Little Sandy Cr., 1 mi. N of Ravia, June 26, 1975, 2m, 3f (PDK); Tishomingo, June 17, 1963, 1m, 1f (OSUS); Pennington Cr., Tishomingo, July 14, 1974, 6m, 8f (PDK). McCurtain Co.: June 10, 1931, 1m (OSUS); N of Eagletown, June 14, 1963, 1f (OSUS); Wright City, July 16, 1963, 3m, 2f (OSUS). Marshall Co.: Enos, July 17, 1963, 1f (OSUS); Willis, June 17, 1963, 1m, 2f, July 2, 1963, 3m, 2f (OSUS), Oct. 18, 1975, 1m (UO). Nowata Co.: Big Cr., 6 mi. ENE of Childers, June 21, 1956, 1f (UO). Ottawa Co.: Fairland, Sept. 24, 1932, 6m, 1f (UKL). Payne Co.: Stillwater, Aug., 1951, 1f (OSUS). Tulsa Co.: Bixby, June 15, 1965, 1f (OSUS). Pennsylvania: Carbon Co.: river, near L. Harmony, Sept. 12, 1968, 1m (JTP). Crawford Co.: Pymatuning L., Turnersville, Oct. 7, 1973, 4m, 8f (PDK). Rhode Island: Providence Co.: Providence, Aug. 3, 1955, 1m, 1f, Sept. 10, 1964, 1f (PC). Washington Co.: Kingston, July 10, 1910, 1m, 1f (CAS), July 12, 1910, 3m, 4f (URI); South Kingstown, Sept. 16, 1966, 1m (PC). South Carolina: Pickens Co.: pond, Clemson, Sept.

9, 1967, 1m (UO); Clemson Univ. dairy pond, Sept. 10, 1975, 1f (CUSC). Orangeburg Co.: South Fork Edisto R., S of Springfield, Sept. 4, 1976, 1m (CUSC). Tennessee: Blount Co.: pond, 6 mi. SSW of Townsend, June 6, 1975, 3m, 6f (PDK). Knox Co.: Knoxville, June 29, 1890, 1f, July 13, 1890, 1f, July 23, 1890, 1f (ISU), 1f (ANSP). Lake Co.: Reelfoot L., 4 mi. E of Tiptonville, Sept. 27, 1976, 25m, 29f (PDK). Shelby Co.: July 29, 1970, 1f, Aug. 12, 1970, 1f (MSUM). Texas: Angelina Co.: pond, 3 mi. NE of Zavalla, June 16, 1976, 15m, 13f (PDK). Aransas Co.: Thomas Slough, 6 mi. S of Austwell, June 15, 1976, 4m, 13f (PDK). Bee Co.: stream, 5 mi. E of Beeville, June 15, 1976, 3m, 3f (PDK). Blanco Co.: 3 mi. S of Blanco, Aug. 26, 1965, 1m (JCS). Bosque Co.: 1 mi. N of Clifton, Aug. 19, 1970, 5m, 6f (TAMU). Bowie Co.: Aug. 20, 1928, 1m (UKL). Brazoria Co.: borrow pit, West Columbia, Jan. 7, 1966, 1m, 2f (JTP); river, 1 mi. W of Lake Jackson, June 15, 1976, 1f (PDK). Brazos Co.: Cedar Cr., Sept. 5, 1970, 1f (TAMU); Navasota R., 6.8 mi. SW of North Zulch, June 14, 1975, 1m (UG); College Station, May 2, 1928, 1f (ISU), Oct. 9, 1952, 1f (TAMU), Oct. 23, 1939, 1m, 1f (BU); Postoak L., College Station, July 25, 1972, 1f, Aug. 9, 1972, 2m, 1f, Aug. 23, 1972, 2m, 1f, Aug. 27, 1972, 1m, Sept. 12, 1972, 1m, 2f, Oct. 3, 1972, 1m, 2f, Oct. 10, 1972, 1m, Nov. 12, 1969, 4m, 3f (TAMU); Bryan, Aug. 30, 1964, 3m, 9f (TAMU), Oct. 25, 1927, 10m, 3f (TAMU), 5m, 1f (LSU), 4m, 1f (ISU). Burnet Co.: Inks Lake St. Pk., May 10, 1970, 3m, 6f (TAMU).

Calhoun Co.: Hog Bayou, 4.5 mi. NE of Tivoli, June 15, 1976, 7m, 9f (PDK). Cass Co.: stock pond, 10 mi. N of Linden, June 29, 1975, 10m, 15f (PDK). Chambers Co.: stream, 4 mi. S of Hankamer, June 16, 1976, 6m, 7f (PDK). Cherokee Co.: 8 mi. NE of Rusk, Nov. 6, 1971, 1m (TAMU). Collin Co.: McKinney, Aug. 12, 1942, 15m, 3f (UKL). Colorado Co.: April 19, 1922, 1f, April 25, 1922, 1f (UKL), May 6, 1922, 1m, 1f (UMSP), 4m, 16f (UKL), May 15, 1922, 2m, 2f (UKL), May 23, 1922, 1m, June 5-6, 1922, 1m, 5f, July 7, 1922, 1f, Aug. 25, 1922, 1m, 6f (UMSP); Skull Cr., July 3, 1922, 1m, 4f (UMSP), Aug. 7, 1922, 1m (USNM); stream, Altair, Aug. 6, 1967, 5m, 7f (JTP); Rock Island, May 4, 1922, 1f, June 6, 1922, 1f, June 27, 1922, 5m, 34f, July 7, 1922, 1m, 1f (UMSP); Columbus, May 23, 1966, 1f (JTP); Sandy Cr., Sheridan, Aug. 6, 1967, 3m, 2f (JTP); 3.5 mi. NW of Rock Island, June 30, 1922, 4m, 3f (UMSP); 6 mi. NE of Rock Island, June 9, 1922, 11m, 25f (UMSP). Comal Co.: Privilege Cr. at Hwy. 46, June 17, 1972, 1m, 1f (TAMU). Denton Co.: Salmon Pond, Denton, Oct. 25, 1970, 1m (PDK). Eastland Co.: Aug. 5, 1920, 3m, 4f (UKL), Aug. 5, 1921, 2m (UMSP), Aug. 9, 1920, 3m, 3f (UKL), Aug. 19, 1920, 1m (UKL), Nov. 2, 1920, 2m, 1f (UMSP); Cisco, Sept. 20, 1920, 3m, 1f (UMSP). El Paso Co.: El Paso, Aug. 27, 1934, 2f (FMNH), 1m (UCS), 1f (USNM), 1f (CU). Gonzales Co.: Ottine, Aug. 6, 1967, 10m, 9f (JTP). Grimes Co.: Navasota, May 2, 1948, 2m, 1f (JTP), 1m, 1f (UCS). Guadalupe Co.: Seguin, June 26, 1938, 4m, 4f (UKL); lake, Seguin, April 23, 1966, 4m, 7f

(JTP). Harris Co.: stream, Webster, July 15, 1966, 5m, 2f (JTP); Buffalo Bayou, Houston, July 5, 1975, 1f (PDK). Harrison Co.: Caddo L., 4 mi. N of Karnack, June 17, 1976, 1f (PDK). Hays Co.: San Marcos, June 18, 1934, 4m, 3f (ISU). Hill Co.: Abbott, June 20, 1934, 2m, 4f (ISU). Jackson Co.: Aug. 9, 1928, 5m (UKL); slough, Ganado, June 5, 1969, 3m, 3f (JTP). Jefferson Co.: Pine Island Bayou, 2.5 mi. S of Sour Lake, June 16, 1976, 1m, 2f (PDK). Kendall Co.: July 22, 1928, 25m, 18f (UKL). Kerr Co.: July 21, 1928, 32m, 12f (UKL). La Salle Co.: Nueces R., 1 mi. S of Cotulla, June 13, 1976, 4m, 4f (PDK). Liberty Co.: pond, 3 mi. S of Cleveland, Dec. 6, 1966, 1m (JTP). Llano Co.: Colorado R., Buchanan Dam, June 16, 1972, 4m, 8f (TAMU). Matagorda Co.: river, 3 mi. E of Wadsworth, June 15, 1976, 93m, 125f (PDK). Maverick Co.: stream, 3 mi. N of Eagle Pass, June 12, 1976, 12m, 10f (PDK). Medina Co.: Natalia, June 19, 1934, 10m, 6f (ISU). Orange Co.: Neches R., 3 mi. W of Vidor, Oct. 9, 1971, 2m (TAMU); 5 mi. S of Vidor, Oct. 9, 1971, 2m, 4f (TAMU). Palo Pinto Co.: July 14, 1928, 10m, 4f (UKL). Polk Co.: lake, 10 mi. W of Woodville, June 16, 1976, 13m, 13f (PDK). Refugio Co.: stream, 3 mi. E of Refugio, June 15, 1976, 9m, 9f (PDK); stock pond, 3 mi. E of Refugio, June 15, 1976, 4m, 3f (PDK). San Jacinto Co.: Double L., Coldspring, Dec. 6, 1966, 1m, 1f (JTP); Coldspring, June 9, 1969, 2f (JTP). San Patricio Co.: Lake Corpus Christi St. Pk., June 9, 1969, 4m, 11f (TAMU); L. Corpus Christi, 4 mi. SW of Mathis, June 15,

1976, 34m, 57f (PDK). Tom Green Co.: Conchos R., Christ-
 oval, May 9, 1964, 2m, 6f (JTP). Uvalde Co.: Frio R., 6
 mi. N of Concan, June 13, 1975, 13m, 17f (UG), June 17,
 1973, 1m, 2f (TAMU); Sabinal R., 1 mi. W of Sabinal, June
 18, 1972, 1m (TAMU). Val Verde Co.: Del Rio, July 8, 1938,
 1m, 7f (UKL); reservoir, Del Rio, June 12, 1976, 2m, 5f
 (PDK); canal, Del Rio, June 12, 1976, 2m (PDK); 13 mi. NW of
 Del Rio, Aug. 9, 1959, 6m, 4f (USNM). Victoria Co.:
 Victoria, Aug. 22, 1952, 1f (USNM). Waller Co.: Hempstead,
 June 24, 1928, 5m, 4f (ISU). Virginia: Accomack Co.: New
 Church, July 14, 1932, 4f (UCR). Albemarle Co.: Sept. 25,
 1947, 1m (VPI); Charlottesville, June 30, 1948, 3m, 4f, July
 22, 1947, 1m, 3f, Aug. 19, 1947, 2m, 1f (VPI). Appomattox
 Co.: June 28, 1948, 2m, 1f, Aug. 25, 1947, 3f (VPI). Din-
 widdie Co.: May 31, 1949, 1f (VPI). Lunenburg Co.: Aug.
 5, 1972, 1m, 2f (VPI). Mecklenburg Co.: Aug. 4, 1972, 8m,
 7f (VPI). Middlesex Co.: Sept. 20, 1933, 1m, 2f (PU).
 Montgomery Co.: pond, Blacksburg, Oct. 4, 1970, 1f (VPI).
 Northumberland Co.: June 25, 1972, 6m, 8f (VPI). Prince
 Edward Co.: Aug. 25, 1947, 2f (VPI). Westmoreland Co.:
 Sept. 20, 1933, 1f (PU). City of Norfolk: April 10, 1932,
 1f (UCR), Aug. 11, 1934, 2m, 2f, Aug. 15, 1928, 13m, 20f,
 Sept. 15, 1928, 2m, 5f, Sept. 20, 1928, 4m, 6f (UKL), 1f
 (JTP), Sept. 28, 1928, 3m, 4f (UKL). City of Virginia
 Beach: Princess Anne, June 1, 1948, 1m (VPI), Aug. 14, 1948,
 1m, 1f (VPI), Oct. 22, 1933, 1m (PU). County unknown: Dis-
 mal Swamp, Aug. 10, 1934, 3f (UKL), Sept. 10, 1933, 1m

(UCR); Chain Bridge, Aug. 7, 1923, 1f (USNM). West Virginia:
Tucker Co.: pond, Parsons, Sept. 8, 1976, 444m, 375f (PDK).
Wisconsin: Sauk Co.: Sept. 26, 1966, 2m (UMC). Walworth
Co.: East Troy, Aug. 10, 1935, 6m, 3f (UKL).

Fig. 111. Color pattern of male T. subnitidus, Story Co., Iowa.

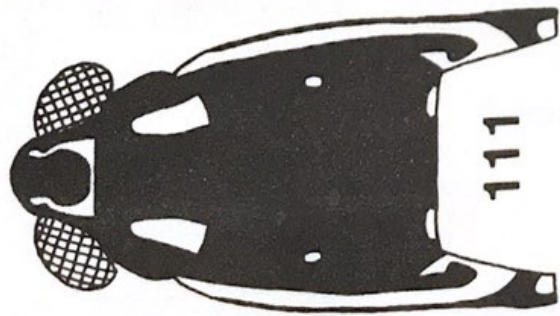
Fig. 112. Color pattern of male T. subnitidus, Washington Co., Arkansas.

Fig. 113. Color pattern of male T. subnitidus, Colorado Co., Texas.

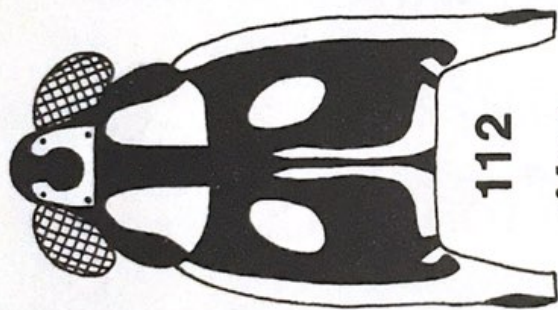
Fig. 114. Color pattern of female T. subnitidus, Middlesex Co., New Jersey.

Fig. 115. Color pattern of female T. subnitidus, Guadalupe Co., Texas.

Fig. 116. Color pattern of female T. subnitidus, Massac Co., Illinois.

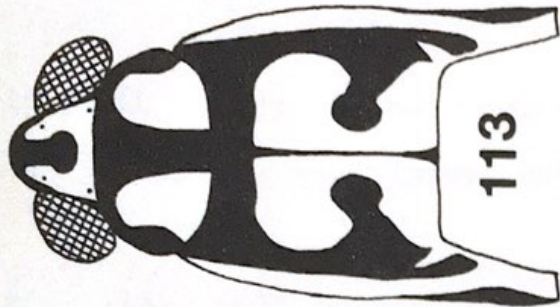


111

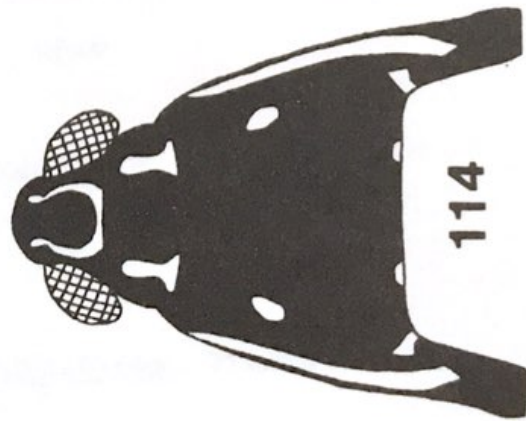


112

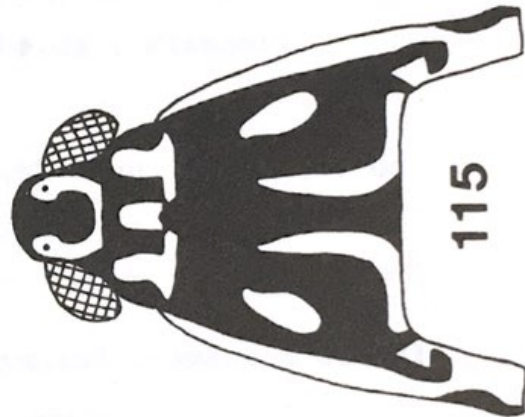
0.5 mm



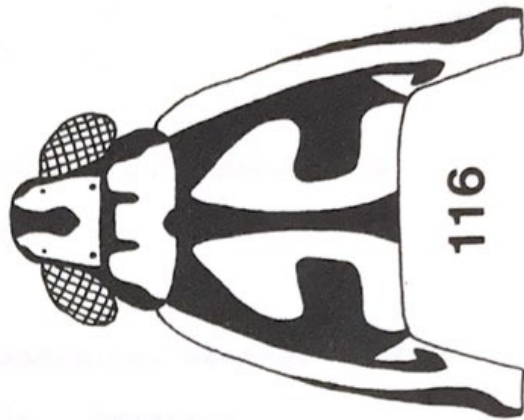
113



114

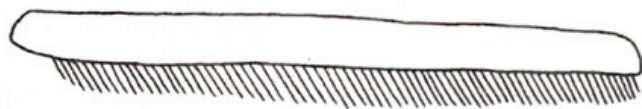


115



116

- Fig. 117. Lateral view of left middle femur of male T. subnitidus, Story Co., Iowa.
- Fig. 118. Left lateral view of abdominal segment 7 of female T. subnitidus, Trumbull Co., Ohio.
- Fig. 119. Left lateral view of abdominal segment 7 of female T. subnitidus, Pope Co., Arkansas.
- Fig. 120. Left lateral view of abdominal segment 7 of female T. subnitidus, Shannon Co., Missouri.
- Fig. 121. Left lateral view of abdominal segment 7 of female T. subnitidus, Benton Co., Arkansas.
- Fig. 122. Dorsal profile of abdominal segment 8 of male T. subnitidus, Trumbull Co., Ohio.
- Fig. 123. Left lateral view of abdominal segment 8 of male T. subnitidus, Trumbull Co., Ohio.
- Fig. 124. Dorsal shaft of endosoma of T. subnitidus, Trumbull Co., Ohio.
- Fig. 125. Left paramere of T. subnitidus, Trumbull Co., Ohio.



117



118



119



120



121



122

0.5 mm



123



124

0.1 mm



125

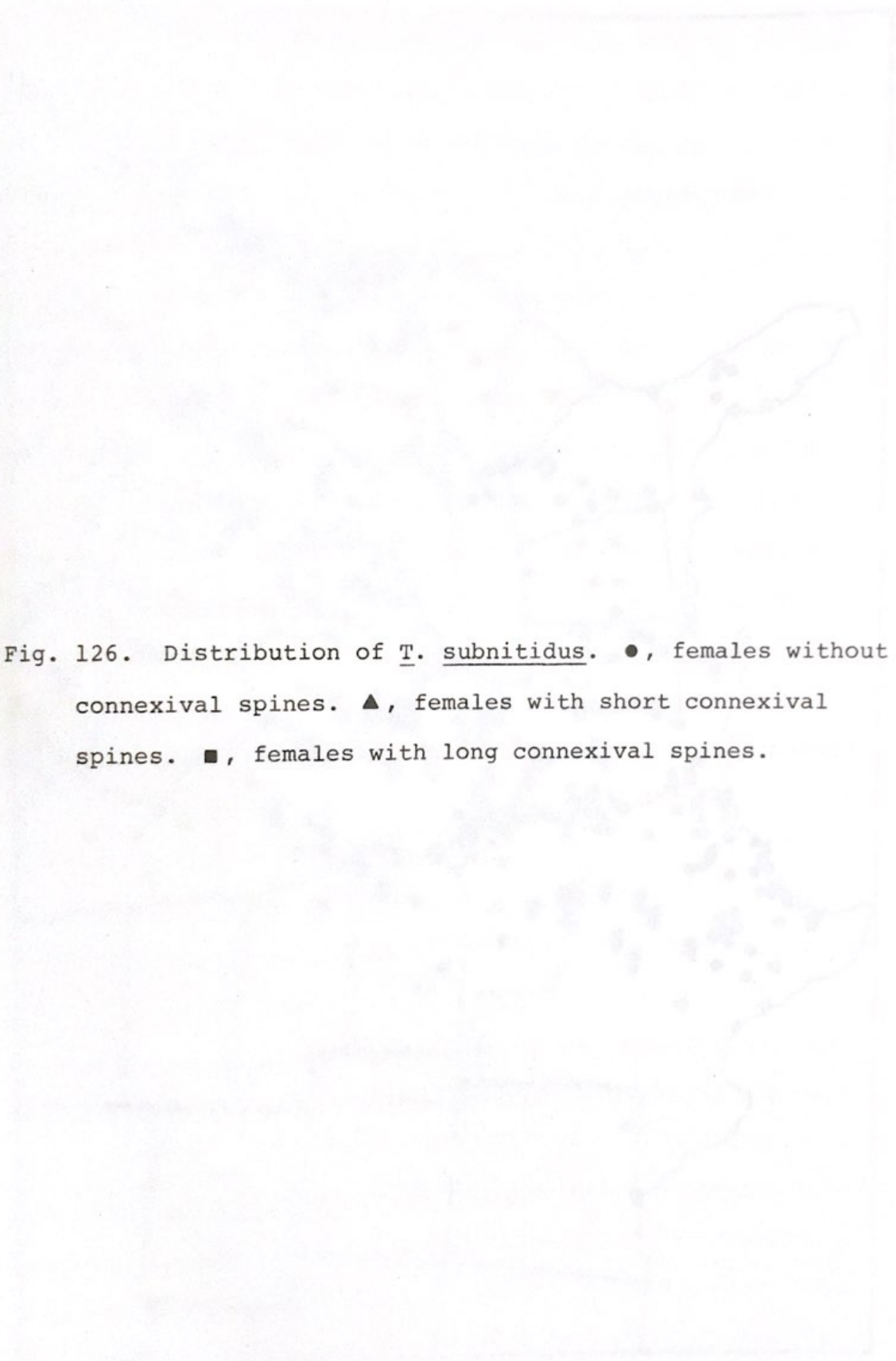
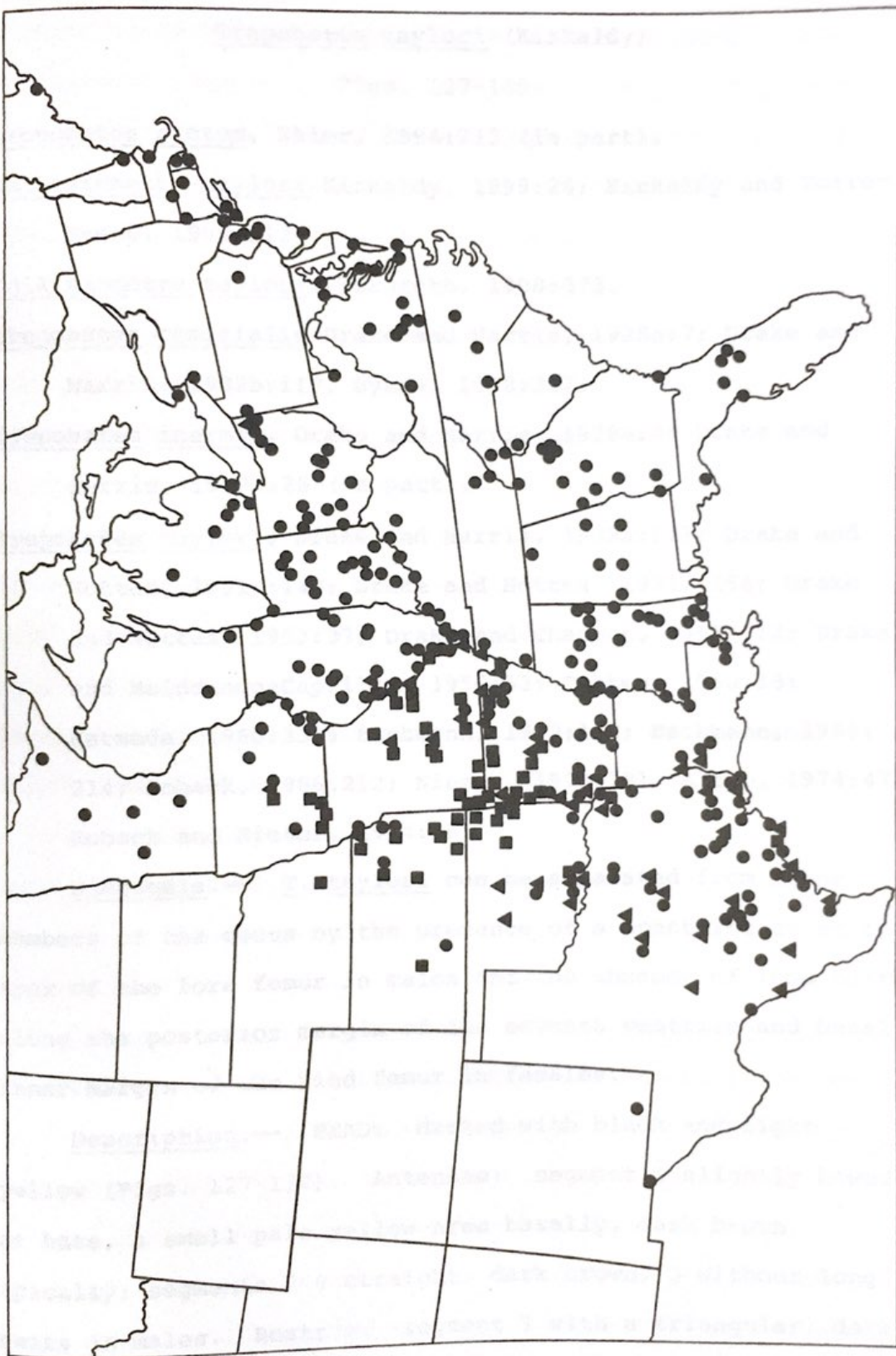


Fig. 126. Distribution of T. subnitidus. ●, females without connexival spines. ▲, females with short connexival spines. ■, females with long connexival spines.



Trepobates taylori (Kirkaldy)

Figs. 127-139

Trepobates pictus, Uhler, 1894:213 (in part).Kallistometra taylori Kirkaldy, 1899:28; Kirkaldy and Torre-Bueno, 1908:212.Callistometra taylori, Bergroth, 1908:373.Trepobates comitialis Drake and Harris, 1928a:7; Drake and Harris, 1932b:117; Hynes, 1948:347.Trepobates inermis, Drake and Harris, 1928a:8; Drake and Harris, 1928b:26 (in part).Trepobates taylori, Drake and Harris, 1932a:111; Drake and Hottes, 1951a:143; Drake and Hottes, 1951b:154; Drake and Hottes, 1952:37; Drake and Chapman, 1953:112; Drake and Maldonado-Capriles, 1956:53; Cobben, 1960:13; Matsuda, 1960:338; Bachmann, 1963:158; Bachmann, 1966:214; Roback, 1966:212; Nieser, 1970:131; Alayo, 1974:47; Roback and Nieser, 1974:36.

Diagnosis.— T. taylori can be separated from other members of the genus by the presence of a constriction at the apex of the fore femur in males and the absence of long hairs along the posterior margin of the seventh ventrite and basal inner margin of the hind femur in females.

Description.— HEAD: Marked with black and light yellow (Figs. 127-132). Antennae: segment 1 slightly bowed at base, a small pale yellow area basally, dark brown apically; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark

brown area dorsally, pale yellow elsewhere; 2 very light in color, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, sometimes pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and light yellow (Figs. 127-132). Pronotum in macropterous form prolonged posteriorly, black with light yellow markings on anterior portion and posterior margin, also laterally in some individuals. Prosternum pale yellow. Anterior femur moderately bowed just beyond middle in males, slightly bowed near base in females; mostly dark brown with pale yellow basally and a light yellow (sometimes yellow-orange) ring at apex; distinctly constricted at apex in males (Fig. 133). Tibia slightly bowed in males, straight in females; mostly dark but usually with a light yellow area at apex. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 127-132), not prolonged posteriorly in females; without a patch of short, dark hairs along mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum usually absent. Black color of mesopleuron extending onto anterior margin of mesosternum, remainder of mesosternum usually pale yellow, but with large, paired brown markings in some populations (Fig. 134). Middle femur with dark brown and light yellow longitudinal markings, males with a thick ventral fringe of long, dark brown hairs; these hairs,

at maximum length, approximately 75-85% of the diameter of the femur. Tibia dark brown; males with a single ventral row of long hairs along basal one-third which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 75-100% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum usually entirely black, sometimes with paired light yellow markings; often with a median patch of long, dark brown hairs in females and sometimes with long hairs along lateral edge. Metasternum usually pale yellow, but dark brown in some populations. Posterior femur usually dark brown but sometimes with a light yellow stripe dorsally; without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black, some marked with light yellow, especially in females; covered with a gray-blue bloom, more extensive in males. Ventriles quite variable in color; mostly yellow except for dark brown laterally in females; dark brown laterally and along anterior margins in males, in some populations almost entirely dark brown; ventrite 7 in females without long hairs posteriorly. Connexival segments usually light yellow with black anterior margins, sometimes entirely black; lateral margins of segments 5 and 6 in males with moderately long, dark hairs; segments 3-7 in females with long, dark hairs, connexiva in females not produced apically.

GENITALIA: Abdominal segment 8 of males with dorsal

profile as in Fig. 135; with very short, thin, pale pubescence ventrally (Fig. 136). Pygophore with very short pubescence at middle and posteriorly. Dorsal shaft of endosoma shown in Fig. 137. Paramere as in Fig. 138.

Measurements.— HEAD: Transocular width of male 0.86-1.02 mm (0.92), female 0.88-1.02 mm (0.94). Interocular space of male 0.31-0.36 mm (0.34), female 0.36-0.41 mm (0.38). Antennae: male— 1) 0.74-0.93 mm (0.85), 2) 0.39-0.50 mm (0.43), 3) 0.40-0.56 mm (0.46), 4) 0.50-0.60 mm (0.56); female— 1) 0.68-0.84 mm (0.76), 2) 0.38-0.48 mm (0.43), 3) 0.44-0.56 mm (0.49), 4) 0.53-0.60 mm (0.56).

PROTHORAX: Pronotum: male— 0.69-0.86 mm (0.78) wide, 0.40-0.50 mm (0.44) long; female— 0.71-0.93 mm (0.81) wide, 0.36-0.42 mm (0.39) long. Anterior femur in male 1.09-1.55 mm (1.34), female 1.09-1.35 mm (1.21). Tibia in male 0.81-0.99 mm (0.90), female 0.78-0.93 (0.86). Tarsus 1 in male 0.06-0.08 mm (0.07), female 0.07-0.11 mm (0.09). Tarsus 2 in male 0.30-0.42 mm (0.38), female 0.34-0.44 mm (0.40).

MESOTHORAX: Mesonotum: male— 1.10-1.37 mm (1.27) wide, 0.79-0.89 mm (0.85) long; female— 1.50-1.85 mm (1.67) wide, 0.89-1.06 mm (0.96) long. Middle femur in male 1.60-2.04 mm (1.84), female 1.71-2.22 mm (1.97). Tibia in male 2.87-3.96 mm (3.43), female 3.16-4.16 mm (3.69). Tarsus 1 in male 0.83-1.16 mm (1.00), female 0.98-1.19 mm (1.08). Tarsus 2 in male 0.73-0.94 mm (0.86), female 0.89-1.06 mm (0.97).

METATHORAX: Posterior femur in male 2.17-2.93 mm (2.59),

female 2.39-3.00 mm (2.70). Tibia in male 0.99-1.46 mm (1.29), female 1.10-1.56 mm (1.35). Tarsus 1 in male 0.41-0.57 mm (0.48), female 0.43-0.58 mm (0.51). Tarsus 2 in male 0.27-0.37 mm (0.31), female 0.31-0.40 mm (0.35).

SIZE: Length— male 2.94-3.37 mm (3.20), female 3.51-4.00 mm (3.69). Width— male 1.10-1.37 mm (1.27), female 1.50-1.85 mm (1.67).

Type Data.— The female holotype of T. taylori is type No. 44361 in the U.S. National Museum and was examined. This specimen was collected by C. B. Taylor at St. Andrew, Jamaica, in September, 1898. The holotype of T. comitalis is in the collection of Iowa State University.

Taxonomy.— The genus Kallistometra was erected by Kirkaldy (1899) for the original description of this species. The description of T. comitalis was based on specimens from Grenada (Drake and Harris, 1928a). Drake and Harris (1932a) recognized that Kallistometra was synonymous with Trepobates and that their T. comitalis was synonymous with T. taylori. T. taylori was misidentified as T. pictus (Uhler, 1894) and T. inermis (Drake and Harris, 1928a, 1928b). Male T. taylori can be easily identified by the presence of a constriction at the apex of the fore femur (Fig. 133) and the absence of long hairs on abdominal segment 8. Females most closely resemble T. subnitidus; however, these two species are sympatric only in southern Texas, and female T. taylori from this area usually have some evidence of mesosternal spots (Fig. 134) and long hairs along the lateral edge of the meta-

notum. These characters are always absent in female T. subnitidus. Female T. subnitidus also have a patch of very short, dark hairs at the posterior end of the mesonotal-mesopleural line which is absent in T. taylori.

Intraspecific Variation.— The highly variable color pattern is shown in Figs. 127-132; this also was illustrated for females from Curacao and Venezuela (Cobben, 1960). The presence of a mesopleural spot posterior to the black post-ocular stripe of the pronotum was highly variable, even within a single population. However, the large majority of specimens examined did not have a mesopleural spot. Most specimens examined did not have mesosternal spots, but this was variable within a single population. This character was most commonly present in populations from Texas, eastern Mexico, and the Yucatan Peninsula. The anterior femoral constriction in males is quite variable in its distinctness but is always present. The presence or absence of metanotal hairs in females was quite variable. The macropterous form is quite common; one-fourth of the specimens examined were winged.

Natural History.— T. taylori is apparently a common species throughout much of its range and occurs on a wide variety of lotic and lentic habitats. It has been reported to inhabit brackish lagoons, marshes, and bays (Drake and Harris, 1928a; Drake and Hottes, 1951a, 1951b, 1952). This species was collected in close association with T. subnitidus and Rheumatobates hungerfordi in Texas during the present

study. T. taylori has been taken with species of Limnogonus, Metrobates, Rheumatobates, and Trepobates (Drake and Hottes, 1951a, 1951b; Cobben, 1960). Specimens have been collected each month of the year; adults were found commonly in Trinidad from November to April (Hynes, 1948). No studies on the life history of T. taylori have been conducted.

Distribution.— T. taylori is widely distributed in Mexico, Central America, northern South America, the West Indies, and the southern United States (Texas) (Fig. 139). New records for Belize, Bolivia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, St. Martin, and the Mexican states of Campeche, Chiapas, Colima, Nayarit, Quintana Roo, Sinaloa, and Yucatan are given below. The records of this species from Argentina (Bachmann, 1963, 1966), Brazil (Nieser, 1970), Colombia (Roback and Nieser, 1974), Cuba (Alayo, 1974), Curacao (Cobben, 1960), and Aguascalientes and Distrito Federal, Mexico (Drake and Hottes, 1952) are accepted as accurate and are included on the distribution map. The record of T. taylori from Michoacan, Mexico (Drake and Hottes, 1952) was based on a misidentified female T. becki, and the records of this species from Arizona and New Mexico (Drake and Chapman, 1953) could not be confirmed; the latter records are not included on the distribution map.

Material Examined.— ARUBA: Roui Andicuri, May 11, 1955, 2m (NN).

BELIZE: Punta Gorda, Feb., 1932, 4m, 3f (USNM), 1m (FMNH), 1m (JTP), Aug., 1934, 6m, 2f (UKL); Belmopan

Riviera, June 13, 1972, 1m (BMNH); New R., 5 mi. S of Orangewalk, Dec. 22, 1973, 2m, 2f (JTP); mangrove swamp, Caye Caulker, Dec. 24, 1973, 2m, 2f (JTP).

BOLIVIA: Santa Cruz, March 15, 1957, 1f (USNM); Cuatro Ojos, May 27, 1957, 1f (USNM); Rio Beni, El Consuelo, Jan., 1938, 1f (UKL); Sud Yungas, Dept. La Paz, Sept., 1938, 6m, 6f (UKL).

BONAIRE: N of Lima, Aug. 19, 1955, 1m (NN).

BRAZIL: Eiru R., near Santo Antonio, Amazonas, Sept. 25-Oct. 17, 1936, 1m, 2f (UKL); Jurua R., near Joao Pessoa, Amazonas, July 10-Sept. 20, 1936, 1m, 5f (UKL); Solimoes R., Manacapuru, Amazonas, June 26, 4m, 8f (UKL).

COLOMBIA: Boca de Geniza, Dept. Atlantico, 1f (UKL).

COSTA RICA: river, 15 mi. N of Esparta, Dec. 24, 1969, 1f (JTP); lake, San Vito de Java, Dec. 29, 1969, 6m, 6f (JTP); San Vito de Java, Dec. 31, 1969, 2m, 2f (JTP); river, N of Palmar Norte, Dec. 28, 1969, 1f (JTP); Barranca, July 26, 1959, 9m, 8f (UKL).

CUBA: 6m (AMNH), 1m (LSU); Havana, Jan. 25, 1932, 5m, 12f (UKL), June, 1930, 1f (USNM); Ojo de Agua El Estero del Rio Yumuri, Matanzas, 1f (UKL); Catalina, Havana Prov., Nov. 27, 1933, 4m, 13f (UKL); Baragua, Camaguey Prov., May 2, 1927, 1f (UKL).

DOMINICAN REPUBLIC: permanent pool, Bajos de Haina, Dec. 29, 1955, 2m, 1f (USNM); Santo Domingo, 1m (AMNH).

ECUADOR: 15 mi. W of Chone, July 9, 1973, 13m, 12f (SCSC); Limonococha, July 2, 1973, 19m (SCSC).

EL SALVADOR: lake, Metapan, Dec. 21, 1969, 4f (JTP).

GRENADA: 1m, 4f (ISU), 3m, 1f (LSU), 1m, 3f (USNM), 1m (BMNH); St. George's, 3f (BMNH), 1f (LSU), 1m (USNM); Woburn, 1f (BMNH).

GUATEMALA: Arroyito Jolomax, Peten, April 19, 1935, 1f (UMAA).

HONDURAS: small stream, 16 mi. S of San Lorenzo, Jan. 9, 1970, 5m, 5f (JTP); Choluteca, July 20, 1957, 3m, 1f (USNM); river, 17 mi. E of Jicaro Galan, Jan. 9, 1970, 2m, 1f (JTP).

JAMAICA: St. Andrew, Sept., 1898, 1f (holotype) (USNM); Montego Bay, March 15, 1911, 1m (AMNH); Mandeville, 1f (AMHH), 1f (JTP); Baron Hill, Trelawny, 2lm, 47f (UKL); Claremont Baron Hill, Trelawny, March 4, 1928, 35m, 69f, Dec. 24, 1938, 31m, 49f (UKL).

MARTINIQUE: 2m (AMNH).

MEXICO: Campeche: Palizada, Sept. 15, 1936, 1f (UKL). Chiapas: Comitán, Jan. 18, 1938, 5m, 9f, Aug. 30, 1937, 1f (UKL); Suchiate, Nov. 16-17, 1932, 2m (UKL); Huixtla, Nov. 9, 1932, 1m, 1f (UKL); Escuintla, Nov. 11, 1930, 1m (UKL); Montebello Lakes, May 3, 1964, 1f (JTP). Chihuahua: Ciudad Camargo, July 26, 1953, 1m (UKL); Rio Conchos, Ciudad Camargo, Aug. 17, 1952, 6m, 7f (JTP). Colima: Santiago, Nov. 25, 1968, 1m, 1f (JTP). Durango: hot spring, Las Conchas, Aug. 1, 1952, 11m, 4f (JTP). Guerrero: lagoon, N of Pie de la Cuesta, April 26, 1964, 3m, 5f (JTP); Acapulco, July 10, 1937, 1f (UKL), July 23, 1950, 1m, 4f (USNM), Aug.

3, 1951, 6m, 9f (USNM), 3m, 3f (JTP), 4f (AMNH), 1m, 1f (UKL), 1f (UCS), 1m (FMNH). Jalisco: brackish bay, Melaque, Nov. 20, 1968, 1f (JTP); Rio Ameca, Puerto Vallarta, June 9, 1975, 1m (JTP); Rio Tomatlan, 11 mi. N of Campo Acosta, June 9, 1975, 1m, 2f (JTP). Nayarit: 21 mi. N of Acaponeta, Nov. 19, 1965, 1m, 1f (JCS); N of Tuxpan, April 21, 1964, 2m (JTP). Oaxaca: Papaloapan, March 4, 1939, 1f (UMAA); pond, 5 mi. E of Tehuantepec, April 30, 1964, 2m, 1f (JTP); Salina Cruz, July 24, 1951, 2f (UKL), 1m (JTP), 1m (OU); E of Tehuantepec, April 30, 1964, 1m (JTP). Puebla: Puebla, July 20, 1951, 1f (JTP), July 30, 1950, 1f (USNM). Quintana Roo: pond, Tulum, Dec. 20, 1973, 2m, 2f (JTP). San Luis Potosi: 30 mi. NE of Ciudad del Maiz, June 19, 1953, 1f (UKL); El Salto Falls, June 15, 1956, 1m (UKL); Ciudad Valles, Aug. 8, 1951, 1f (USNM); 2 mi. SE of Pedro Montoya, July 27-28, 1970, 13m, 14f (TAMU). Sinaloa: pond, Mazatlan, May 31-June 1, 1966, 24m, 38f (JTP), 2m, 4f (CSU), 2m, 2f (UCS), 1m, 2f (BMNH); Escuinapa, April 21, 1964, 2m, 1f (JTP). Tamaulipas: Tampico, July 16, 1950, 2f (USNM); 2 mi. SE of Gomez Farias, July 20, 1970, 4m, 12f (TAMU). Veracruz: 15 mi. W of Veracruz, June 30, 1953, 1f (UKL); Minatitlan, Sept. 22, 1936, 3f (UKL); 8 mi. NE of Catemaco, July 3, 1971, 1m (TAMU); Alvarado, July 28, 1951, 1m (JTP), 1f (USNM); Rio Metlac, near Fortin, Dec. 17, 1948, 2f (CAS); borrow pit, 14 mi. N of Nautla, Jan. 7, 1971, 1f (JTP); Rio Paso de Ovejas, Jan. 6, 1971, 1m (JTP); 4 mi. S of Loma Bonita, Jan. 15, 1970, 1m (JTP); 15 mi. SE of Tantoyuca,

Aug. 28, 1965, 1f (USNM). Yucatan: lake, 1.5 mi. S of Libre Union, Dec. 16, 1973, 3m, 1f (JTP). State unknown: Tezpanquopan, Sept. 28, 1937, 1f (UKL).

PANAMA: Canal Zone, Feb. 10, 1939, 5m, 10f (USNM); Ft. Clayton, Canal Zone, Nov. 11, 1932, 6m, 2f (UKL); Barro Colorado, Feb. 6-8, 1939, 1f (USNM); river, 3 mi. N of San Carlos, Jan. 4, 1970, 1f (JTP); San Carlos, Jan. 4, 1970, 1f (JTP); Rio Chilibre, E of Panama, Jan. 2, 1969, 1m, 2f (JTP).

PERU: Tulumayo R., near Tingo Maria, Sept. 25, 1955, 2m, 1f (USNM); Rio Paucartambo Quiroz, Dec., 1933, 2m, 2f (USNM); La Merced, Junin, Nov., 1933, 9m, 6f (USNM); Rio Bella, near Tingo Maria, Oct. 4, 1955, 1f (USNM); Rio Rondos, near Tingo Maria, Sept. 29, 1955, 1m, 2f (USNM); Cucharas R., Fuallago, Aug., 1954, 1m (USNM), 1f (BMNH); Cucharas R., Pacaya, Aug., 1954, 3m, 2f (USNM), 1m, 1f (BMNH); Rio Rimac, Lima, Sept., 1933, 2m (LSU), 1m (MSU), 1f (CU); Tingo Maria, Sept. 9, 1944, 7m, 6f (USNM), Sept. 10, 1944, 16m, 10f (USNM), Sept. 16, 1944, 9m, 4f (USNM), 1m (CU); Quincemil, Sept., 1962, 4m, 2f (JTP), 1f (OU); Apurimac R., Prov. La Mar. Sivia, Dept. Ayachuco, June 15-28, 1941, 17m, 18f (UKL); Huallaga R., near Cucharas, Dept. Huanuco, July, 1954, 15m, 12f (UKL); pond, near Tarapoda, Dept. San Martin, Feb. 16, 1947, 1f (UKL); Prov. Tarma, Dept. Junin, Oct. 19-26, 1940, 1m, 3f (UKL); near Shapajilla, Dept. Huanuco, July 5-Aug. 10, 1938, 5m, 14f (UKL); stream, near Rio Negro, Oct. 29, 1935, 1m (UKL).

ST. MARTIN: Jan., 1957, 5f (JTP).

TOBAGO: Doctors R., April 12, 1942, 8m, 7f (BMNH).

TRINIDAD: Sept. 27, 1931, 1m, 4f (UKL); Aripo Savanna, Feb. 22, 1967, 3f (OU), 1m (JTP); Caroni Swamp, Jan., 1967, 1m (OU); Pitch L., Sept. 7, 1930, 1m (BMNH); ICTA farm pond, Jan. 1, 1942, 3f, Nov. 25, 1941, 1m, 6f (BMNH); ICTA rice fields, Jan. 27, 1942, 4m, 7f, Dec. 11, 1941, 1m, 2f (BMNH); Yarra R., Blanchisseuse, Dec. 27, 1941, 2f (BMNH); Jan. 29, 1955, 1f (NN), Oct. 27-29, 1938, 19m, 8f (USNM).

UNITED STATES: Texas: Bandera Co.: Hondo Cr. and Rt. 470, June 14, 1975, 1m (UG). Brooks Co.: Falfurrias, Nov. 2, 1932, 3m, 2f (UKL). Cameron Co.: Brownsville, June 30, 1938, 3m, 12f (UKL), Nov. 13, 1944, 1m, 3f (USNM). Hidalgo Co.: July 28, 1928, 2m, 8f (UKL); Weslaco, July 16, 1930, 9m, 7f (ISU), 3m, 1f (LSU), July 17, 1927, 6m, 13f (LSU), 1m, 2f (CAS), 1m, 1f (ISU), 1f (MSU), 1f (TAMU); Los Ebanos, Oct. 18, 1944, 1m (UCB); Progreso, July 1, 1938, 1f (UKL); McAllen, July 2, 1938, 1f, Nov. 20, 1932, 4m, 9f (UKL). San Patricio Co.: Sinton, Nov. 8, 1932, 1m (UKL); L. Corpus Christi, 4 mi. SW of Mathis, June 15, 1976, 4m, 4f (PDK). Starr Co.: Arroyo Salado, 14 mi. E of Rio Grande City, June 11, 1975, 4m, 4f (UG); pond, 3.9 mi. E of El Sauz, June 12, 1975, 1m, 1f (UG). Val Verde Co.: canal, Del Rio, June 12, 1976, 8f (PDK); reservoir, Del Rio, June 12, 1976, 6m, 6f (PDK). Willacy Co.: pond, 10 mi. W of Raymondville, June 14, 1976, 16m, 24f (PDK). Zapata Co.: pond, Zapata, June 13, 1976, 5m, 1f (PDK); Arroyo Dolores,

12 mi. N of San Ygnacio, June 13, 1976, 1m, 1f (PDK).

VENEZUELA: Estanque de Santa Ana, Pen. de Paraguana,
Feb. 16, 1937, 10m, 1f (USNM); Maracay, Nov. 15, 1956, 1f
(NN).

Fig. 127. Color pattern of male T. taylori, Sinaloa, Mexico.

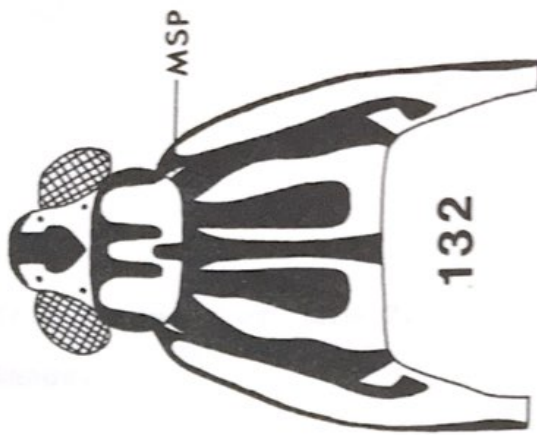
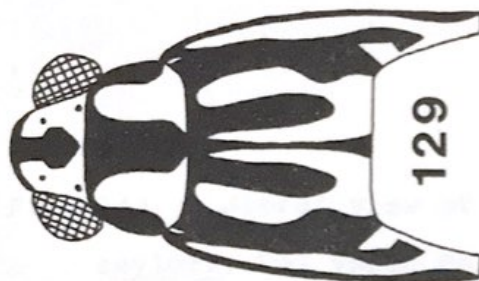
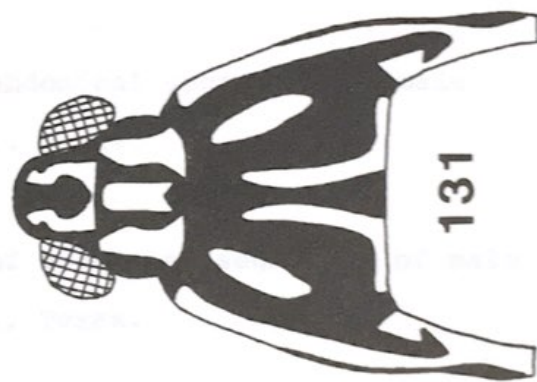
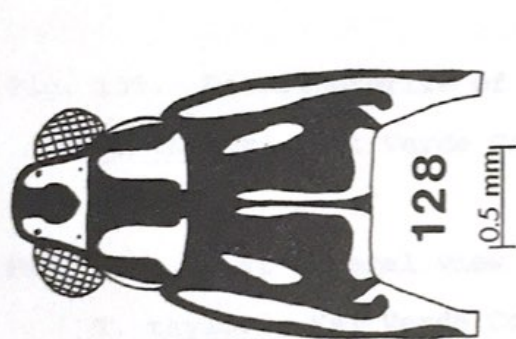
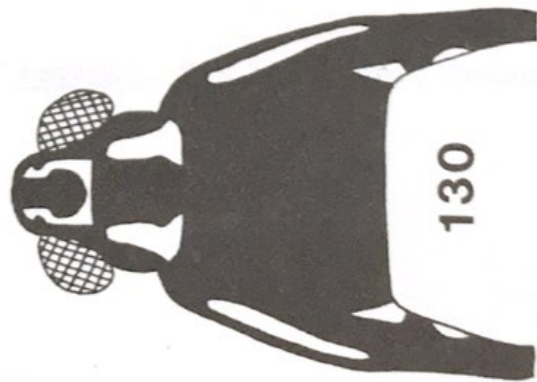
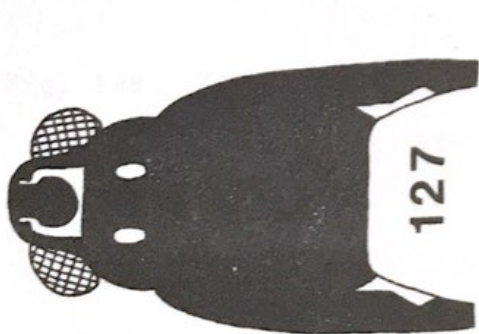
Fig. 128. Color pattern of male T. taylori, Zapata Co., Texas.

Fig. 129. Color pattern of male T. taylori, Oaxaca, Mexico.

Fig. 130. Color pattern of female T. taylori, Sinaloa, Mexico.

Fig. 131. Color pattern of female T. taylori, Quincemil, Peru.

Fig. 132. Color pattern of female T. taylori, Oaxaca, Mexico. MSP, mesopleural spot.






Fig. 133. Lateral view of left fore femur of male T. taylori, Val Verde Co., Texas.

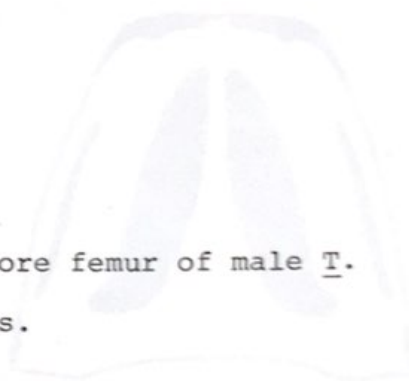


Fig. 134. Mesosternum of female T. taylori, Val Verde Co., Texas.

Fig. 135. Dorsal profile of abdominal segment 8 of male T. taylori, Val Verde Co., Texas.

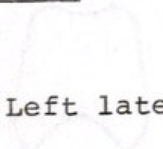


Fig. 136. Left lateral view of abdominal segment 8 of male T. taylori, Val Verde Co., Texas.

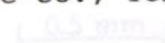


Fig. 137. Dorsal shaft of endosoma of T. taylori, Val Verde Co., Texas.


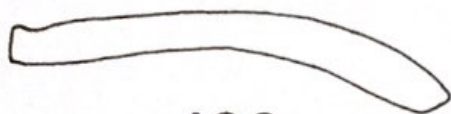


Fig. 138. Left paramere of T. taylori, Val Verde Co., Texas.



133

| 0.5 mm |



134

| 0.5 mm |



135

| 0.5 mm |



136



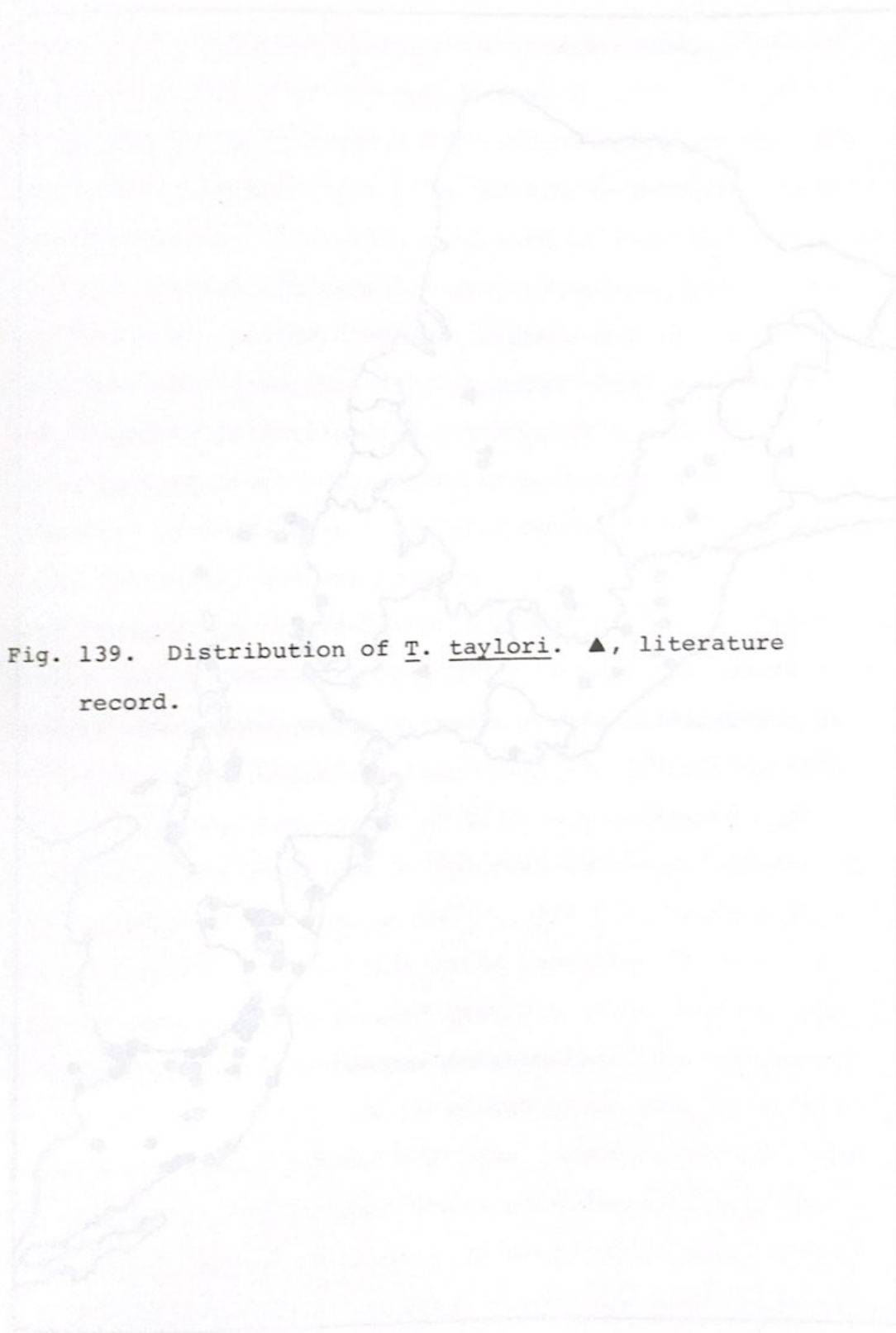
137

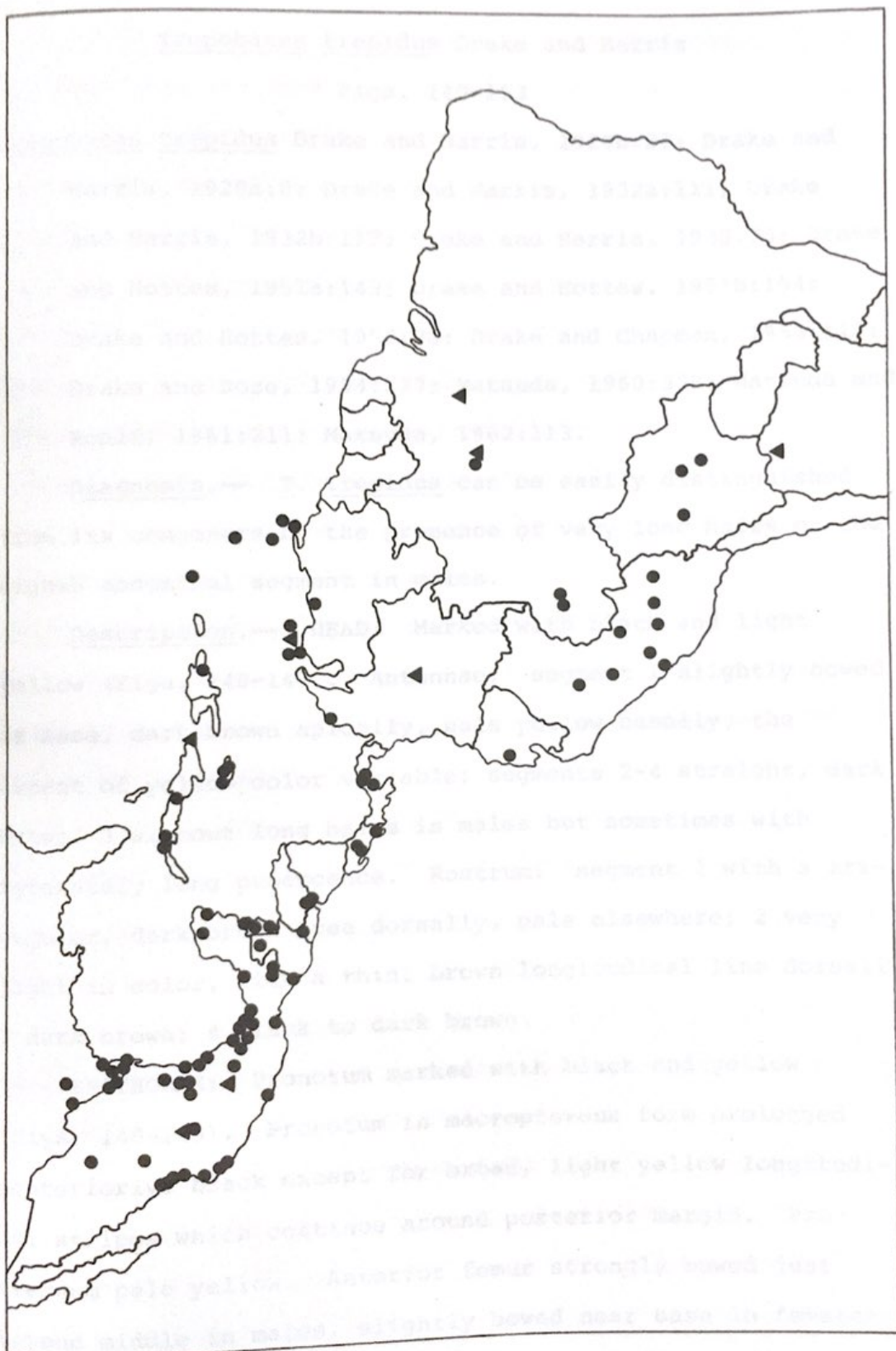
| 0.1 mm |



138

Fig. 139. Distribution of T. taylori. ▲, literature record.





Trepobates trepidus Drake and Harris

Figs. 140-153

Trepobates trepidus Drake and Harris, 1928b:27; Drake and Harris, 1928a:8; Drake and Harris, 1932a:111; Drake and Harris, 1932b:117; Drake and Harris, 1938:75; Drake and Hottes, 1951a:143; Drake and Hottes, 1951b:154; Drake and Hottes, 1952:38; Drake and Chapman, 1953:112; Drake and Roze, 1954:227; Matsuda, 1960:338; Matsuda and Rohlf, 1961:211; Matsuda, 1962:113.

Diagnosis.— T. trepidus can be easily distinguished from its congeners by the presence of very long hairs on the eighth abdominal segment in males.

Description.— HEAD: Marked with black and light yellow (Figs. 140-145). Antennae: segment 1 slightly bowed at base, dark brown apically, pale yellow basally, the extent of yellow color variable; segments 2-4 straight, dark brown, 3 without long hairs in males but sometimes with moderately long pubescence. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 very light in color, with a thin, brown longitudinal line dorsally; 3 dark brown; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and yellow (Figs. 140-145). Pronotum in macropterous form prolonged posteriorly, black except for broad, light yellow longitudinal stripes which continue around posterior margin. Prosternum pale yellow. Anterior femur strongly bowed just beyond middle in males, slightly bowed near base in females;

dark brown at middle, pale yellow basally, and with a light yellow ring at apex; distinctly constricted at apex in males (Fig. 146). Tibia slightly bowed in males, straight in females; dark brown basally, light yellow apically. Tarsus 1 and tarsus 2 dark brown.

MESOTHORAX: Mesonotum with black and light yellow markings (Figs. 140-145), not prolonged posteriorly in females; a patch of short, dark hairs occasionally present along posterior portion of mesonotal-mesopleural line in females. A light yellow mesopleural spot posterior to black postocular stripe of pronotum very rarely present in extremely light individuals. Black color of mesopleuron extending onto anterior margin of mesosternum, remainder of mesosternum pale yellow. Middle femur with dark brown and light yellow longitudinal stripes, males with a thick ventral fringe of long, dark brown hairs; these hairs, at maximum length, approximately 60-80% of the diameter of the femur. Tibia dark brown; males with a single ventral row of short hairs along basal one-half which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 65-95% of the diameter of the tibia. Tarsus 1 and tarsus 2 dark brown.

METATHORAX: Metanotum with black and light yellow markings; usually with a median patch of long, dark hairs in females. Metasternum pale yellow. Posterior femur mostly dark brown but with a pale yellow stripe dorsally; with a dense fringe of usually long hairs along basal inner margin

in females (Fig. 148), these hairs sometimes very short. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black, some marked with light yellow, especially in females; mostly covered with a gray-blue bloom, more extensive in males. Ventrites mostly pale yellow but some black laterally, especially in males; with long, pale pubescence in males; ventrite 7 in females with a row of long, dark brown hairs along posterior margin (Fig. 147), this row not as distinctly interrupted at middle as in *T. becki*. Connexival segments mostly light yellow with black anterior margins, sometimes entirely black; lateral margins of segments 5 and 6 with moderately long, dark hairs in males and long, dark hairs in females; connexiva in females not produced into spines at apex.

GENITALIA: Dorsal profile of abdominal segment 8 of males as in Fig. 149; very hairy ventrally (Fig. 150), with paired, thick patches of very long, brown hairs at base and long brown hairs at middle and posteriorly. Pygophore with scattered, long, brown hairs at middle and short pubescence posteriorly. Dorsal shaft of endosoma shown in Fig. 151. Paramere as in Fig. 152.

Measurements.— **HEAD:** Transocular width of male 0.99-1.08 mm (1.02), female 0.94-1.09 mm (1.04). Interocular space of male 0.37-0.43 mm (0.40), female 0.38-0.45 mm (0.41). Antennae: male— 1) 0.86-1.02 mm (0.94), 2) 0.43-0.53 mm (0.49), 3) 0.45-0.60 mm (0.52), 4) 0.56-0.66 mm (0.62); female— 1) 0.68-1.02 mm (0.83), 2) 0.36-0.50 mm

(0.45), 3) 0.38-0.53 mm (0.49), 4) 0.55-0.64 mm (0.60).

PROTHORAX: Pronotum: male— 0.82-0.96 mm (0.88) wide, 0.48-0.57 mm (0.51) long; female— 0.76-0.96 mm (0.87) wide, 0.38-0.51 mm (0.45) long. Anterior femur in male 1.32-1.55 mm (1.43), female 1.16-1.49 mm (1.30). Tibia in male 0.97-1.09 mm (1.03), female 0.88-1.06 mm (0.96). Tarsus 1 in male 0.07-0.09 mm (0.08), female 0.08-0.11 mm (0.09). Tarsus 2 in male 0.41-0.51 mm (0.44), female 0.38-0.50 mm (0.43).

MESOTHORAX: Mesonotum: male— 1.36-1.55 mm (1.44) wide, 0.81-1.02 mm (0.92) long; female— 1.47-1.94 mm (1.73) wide, 0.84-1.16 mm (1.02) long. Middle femur in male 1.55-2.07 mm (1.91), female 1.84-2.32 mm (2.07). Tibia in male 3.47-4.07 mm (3.76), female 3.42-4.19 mm (3.88). Tarsus 1 in male 1.02-1.28 mm (1.10), female 1.12-1.52 mm (1.25). Tarsus 2 in male 0.95-1.06 mm (1.01), female 0.98-1.21 mm (1.09).

METATHORAX: Posterior femur in male 2.57-3.16 mm (2.86), female 2.60-3.47 mm (2.98). Tibia in male 1.32-1.56 mm (1.43), female 1.27-1.60 mm (1.47). Tarsus 1 in male 0.50-0.67 mm (0.61), female 0.45-0.66 mm (0.58). Tarsus 2 in male 0.31-0.41 mm (0.37), female 0.30-0.44 mm (0.37).

SIZE: Length— male 3.26-3.89 mm (3.62), female 3.16-4.26 mm (3.81). Width— male 1.36-1.55 mm (1.44), female 1.47-1.94 mm (1.73).

Type Data.— The male holotype, female allotype, and

one male and two female paratypes, all in the collection of Iowa State University, were examined. Five male and one female paratypes are in the Drake Collection, U.S. National Museum, and were also studied. All of the above specimens were collected January 14, 1899, by H. E. Summers at Soledad, Veracruz, Mexico. One macropterous male paratype from Gualan, Guatemala, is also in the collection of Iowa State University.

Taxonomy.— T. trepidus has not been confused with any other species in the literature. Males are easily recognized by the presence of very long hairs on the eighth abdominal segment. Females can be identified by the long hairs on the posterior margin of the seventh ventrite, long hairs on the inner basal margin of the hind femur, and characteristic color pattern.

Intraspecific Variation.— The color pattern of T. trepidus is highly variable (Figs. 140-145). Hairs along the posterior portion of the mesonotal-mesopleural line are usually absent in females, while metanotal hairs are usually present in females. A mesopleural spot posterior to the black postocular stripe of the pronotum is present only in extremely light individuals. The length of hairs along the inner basal margin of the hind femur in females varies from short to moderately long. The constriction at the apex of the fore femur in males is somewhat variable in distinctness. Forty percent of all specimens studied were macropterous.

Natural History.— T. trepidus is apparently a common

species throughout much of its range. Although recorded from both lotic and lentic habitats, the great majority of records are from creeks and rivers. It has been reported to inhabit brackish lagoons, marshes, and bays (Drake and Hottes, 1951a, 1951b, 1952). T. trepidus has been collected with species of Limnogonus, Metrobates, Rheumatobates, and Trepobates (Drake and Hottes, 1951a, 1951b). This species has been collected each month of the year, with the majority of records in December, January, and April through August. Matsuda (1962) presented measurements of antennal and leg segments for nymphs of T. trepidus and also figured the nymphs of this species; however, no information on eggs, eclosion, or developmental times was presented.

Distribution.— T. trepidus is widely distributed from Arizona southward through Mexico and Central America and into northern South America (Fig. 153). New records for Belize, Ecuador, El Salvador, Honduras, Nicaragua, and the Mexican states of Baja California del Sur, Chiapas, Colima, Morelos, Nayarit, Nuevo Leon, Queretaro, Sinaloa, and Sonora are presented below. The records of this species from New Mexico, Texas, and Durango, Mexico (Drake and Hottes, 1952) could not be confirmed and are not included on the map.

Material Examined.— BELIZE: Privassion Cr., Mtn. Pine Ridge, Dec. 30, 1973, 1f (JTP).

COLOMBIA: Mamatoco, Aug. 22, 1920, 1m (UMAA); Villavieja, 1m, 6f (UKL).

COSTA RICA: July 16, 1959, 1m (USNM); Rio Virilla,

Dec. 26, 1931, 7m, 6f (UKL); Santa Ana, July 9, 1959, 1f (UKL); San Jose, 15m, 29f (UKL); Rio Tiribi, San Jose, June 29, 1959, 1m, 2f, July 31, 1959, 2m, 4f, Aug. 22, 1959, 1m (UKL); 16 mi. S of La Cruz, July 13, 1965, 1f, July 25, 1965, 1m, 1f (USNM); Universitaria, July 29, 1959, 4m, 2f (UKL), 1m, 1f (UMAA); jungle stream, 20 mi. S of San Isidro, Dec. 27, 1969, 1m, 1f (JTP); Cartago, June 28, 1958, 1m, 1f (UMAA); Golfito, July 13, 1957, 1m, 2f (LACM); Barranca, July 26, 1959, 11m, 13f (UKL); Rio Barranca, Barranca, Jan. 10, 1970, 4f (JTP); river, N of Palmar Norte, Dec. 28, 1969, 4m, 1f (JTP); S.J.C. Nara, NE of Quepos, July 16, 1975, 3m, 2f (USU); 9 mi. NW of Esparta, July 22, 1965, 1m, 1f (USNM); Guanacaste, July 16, 1957, 3m, 3f (USNM).

ECUADOR: Tena, March 29-April 10, 1923, 12m, 10f (UKL); Rio Buena Vista, 6 mi. E of Puerto Lopez, Dec. 14, 1957, 6m, 4f (CAS); 15 mi. W of Chone, July 9, 1973, 1m (SCSC); 19 mi. SSE of Santo Domingo, Aug. 8, 1973, 2m, 1f (SCSC).

EL SALVADOR: San Salvador, July 6, 1957, 1m (USNM); La Union, July 23, 1957, 1f (USNM); river, 13 mi. NW of El Amatillo, Dec. 21, 1969, 27m, 23f (JTP); La Libertad, May 14, 1958, 6m, 11f (USNM), 1m, 1f (BMNH); Santa Ana, July 28, 1957, 1m, 1f (USNM); Nat. Univ. Campus, Dept. San Salvador, July, 1975, 7m, 10f (UG); 7 mi. SE of Ciudad Arce, Aug. 3, 1965, 1f (USNM).

GUATEMALA: El Salto, Escuintla, June 28, 1934, 2f (UKL), 1f (BPBM); 12 mi. N of Salama, March 24, 1946, 1f

(USNM); Antigua Guatemala, Sept. 16, 1946, 10m, 2f (ISU); Mazatenango, Aug. 1, 1957, 2m, 2f (USNM); 15 mi. SE of Jutiapa, 1m (BMNH); Guatemala, 1f (HCC); stream, 10 mi. N of Ascuncion Mita, Jan. 10, 1970, 4m, 5f (JTP); Los Amates, 1f (AMNH); Jutiapa, July 30, 1957, 5m, 2f (USNM); Stain Creek, 7 mi. N of Zacapa, Jan. 11, 1970, 2m (JTP); Gualan, Jan. 23, 1905, 1m (paratype) (ISU), 1f (not paratype) (PU), 7m, 5f (not paratypes) (UKL).

HONDURAS: Choluteca, Aug. 21, 1957, 43m, 27f (USNM); Valle, July 23, 1957, 1f (USNM); river, 17 mi. E of Jicaro Galan, Jan. 9, 1970, 1m (JTP); 10 mi. W of Choluteca, July 29, 1965, 1f (USNM); San Marcos de Colon, July 28, 1965, 12m, 17f (USNM); Coyoles, July 30, 1967, 1m (LACM); Morazan, July 22, 1957, 2f (USNM); small stream, 16 mi. S of San Lorenzo, Jan. 9, 1970, 2m (JTP).

MEXICO: Aguascalientes: Aguascalientes, Aug. 5, 1950, 2m, 1f (USNM), 1f (FMNH), 1f (BMNH), 1m (CU). Baja California Sur: La Paz, July 21, 1959, 3m, 3f (JTP), 2m, 1f (OU), 1m, 1f (AMNH); Mulege, May 14, 1921, 1m, 7f (CAS), 2m (USNM), June 28, 1933, 1m (CAS); Arroyo Agua de los Posos, 12.4 mi. E of La Paz, Jan. 4, 1959, 4m, 2f (CAS); 20 mi. N of Comondu, July 23, 1938, 1f (CAS); Presa Agua Caliente, 7 mi. S of Santiago, June 9, 1974, 2m (PDK); Santiago, June 8, 1974, 1f (PDK); Isla Espiritu Santo, June 9, 1921, 2m (CAS); El Triunfo, July 7-13, 1938, 1m, 1f (CAS). Chiapas: Tuxtla Gutierrez, Aug. 27, 1937, 20m, 22f (UKL); Comitán, Jan. 18, 1938, 1m, Aug. 30, 1937, 1m, 1f (UKL); Ocozocoautla, Aug.

25, 1937, 3m, 4f (UKL); L. Tepancuapa, Aug. 28, 1937, 1f (UKL); Hda. La Libertad, Sept. 1, 1937, 1m (UKL); Simojovel, July 22-Aug. 13, 1958, 1m, 1f (JTP); Suchiapa, July 12, 1957, 1m (JTP); Rio Laja, S of Bochil, Jan. 6, 1973, 1m (JTP); 12 mi. E of Chiapa de Corzo, June 23, 1965, 1m, 2f (JCS); 7 mi. N of Arriaga, May 1, 1964, 5m, 2f (JTP); stream, Soyalo, May 4, 1964, 8m, 8f (JTP); 10.1 mi. S of San Gregorio, May 25, 1965, 2f (CAS); small stream, 19 mi. N of Arriaga, May 1, 1964, 18m, 15f (JTP); pond, Pichucalco, May 5, 1964, 3m, 2f (JTP); stream, W of Chiapa de Corzo, Jan. 14, 1970, 2f (JTP). Chihuahua: Ciudad Camargo, July 12, 1951, 1m (FMNH). Colima: Rio Armeria, Armeria, Nov. 26, 1968, 1m (JTP). Distrito Federal: July 7, 1937, 1f (UKL), July 30, 1950, 1f (USNM). Guerrero: Palo Blanco, Oct. 10, 1936, 4m, 3f (UKL); Chilapa, Nov. 29, 1930, 1m, 1f (UKL); Taxco, Oct. 10, 1936, 6m, 14f (UKL); La Sabana, Oct. 20, 1936, 6m, 11f (UKL); Iguala, Oct. 7, 1938, 4m, 4f (UKL); Tierra Colorada, Oct. 31, 1936, 2m (UKL); Rincon, Oct. 31, 1936, 10m, 18f (UKL); S of Chilpancingo, April 26, 1964, 1f (CSU), 1m (JTP); stream, 40 mi. N of Acapulco, April 26, 1964, 20m, 2f (JTP); Rio Mexcala, 3 mi. S of Iguala, April 26, 1964, 1m, 1f (JTP); 9 mi. N of Zumpango, Jan. 8, 1956, 1m (JCS); 15 mi. NE of Acapulco, Jan. 13, 1956, 1m, 1f (JCS); Acapulco, July 23, 1950, 1f (USNM), Aug. 3, 1951, 2m, 5f (USNM), 1m, 1f (FMNH), 1m (UCS). Jalisco: July 11, 1957, 1f (USNM); Tecolotlan, Sept. 15, 1938, 1m, 3f (UKL); Chapala, Sept. 11, 1938, 2m, 5f (UKL); 11 mi. S of Guadalajara, July

18, 1953, 1f (UKL); Guadalajara, Sept. 10, 1938, 1m (UKL); Rio Ameca, Puerto Vallarta, June 9, 1975, 1m (JTP); Rio Tomatlan, 11 mi. N of Campo Acosta, June 9, 1975, 1f (JTP); 18 mi. N of Guadalajara, April 22, 1964, 1m, 1f (JTP); 3 mi. E of Plan de Barrancas, Aug. 26, 1959, 1m (LACM); Rio Apmila, 2 mi. NW of La Huerta, March 10, 1957, 3m, 1f (UMAA). Mexico: Tejupilco, June 15-18, 1933, 23m, 8f (UCB), 5m, 1f (CAS), 3m, 1f (UKL), 1m, 2f (USNM), 1m, 1f (OU), 1f (BMNH); Bejucos, July 3-4, 1933, 1m, 1f (UCB). Michoacan: Aug. 11, 1957, 1m (USNM); 10 mi. S of Chinapa, Sept. 5, 1938, 1m (UKL); Zitacuaro, Aug. 9, 1957, 1m (USNM). Morelos: Acatlipa, May 5-6, 1945, 7m, 8f, Oct. 17, 1936, 20m, 29f (UKL); Rio Amacuzac, Oct. 14, 1963, 1m (UKL); Tres Cumbres, Oct. 1, 1936, 11m, 8f (UKL); Mazatepec, April 29, 1944, 4m, 10f (UKL); Cuernavaca, April 17, 1976, 1m (AMNH), July 31, 1950, 1m, 1f (USNM), 1m (BMNH), Oct. 5, 1936, 2m, 7f (UKL); 5 mi. W of Zacatepec, April 25, 1964, 2m (JTP); 4 mi. N of Amacuzac, April 25, 1964, 5m, 5f (JTP); Cuautla, April 25, 1964, 2f (JTP), Oct. 12, 1936, 11m, 8f (UKL); stream, 2 mi. S of Cuautla, April 25, 1964, 1m (JTP); 20 mi. S of Cuernavaca, April 27, 1964, 7m, 28f (JTP). Nayarit: Aug. 12, 1957, 1m (USNM); stream, Ixtlan del Rio, Sept. 22, 1953, 5m, 7f (UKL); 15 mi. E of San Blas, April 21, 1964, 7m, 5f (JTP); 5 de Mayo, April 21, 1964, 1f (JTP); river, Santa Cruz, June 8, 1975, 1m, 1f (JTP); jungle river, San Blas, June 7, 1975, 1m, 2f (JTP); Compostela, Aug. 26, 1959, 1m, 2f (USNM); large spring, San Blas, June 3, 1966, 1m, 4f

(JTP); 7 mi. E of San Blas, April 21, 1964, 1f (JTP); stream, 1 mi. SW of Tetilan, March 27, 1955, 1m (UMAA); small stream, El Refilion, June 8, 1975, 1m, 1f (JTP); 15 mi. N of Tepic, April 27, 1961, 1m (CNC); 23 mi. NW of Tepic, Sept. 10, 1972, 1f (USU); Arroyo Santiago, 3 mi. NW of Jesus Maria, July 4, 1955, 1m (JTP). Nuevo Leon: 6 mi. S of Monterrey, Aug. 12, 1959, 2m, 2f (USNM); Monterrey, June 17, 1934, 4m (ISU), Nov. 22, 1932, 2m, 1f (UKL); Rio Cabezano, 17 mi. N of Linares, Dec. 14, 1969, 2m, 3f (JTP); Sabinas Hidalgo, June 17, 1934, 1m, 1f (ISU). Oaxaca: 3 mi. W of Tapanatepec, July 10, 1953, 3m, 3f (UKL); 6 mi. W of Zanatepec, July 9, 1953, 11m, 11f (UKL); 16 mi. N of Juchitan, July 6, 1955, 1m, 1f (UKL); 17 mi. E of Juchitan, July 8, 1953, 5m, 7f (UKL); 9 mi. SE of El Tule, Aug. 24, 1965, 1f (USNM); 19 mi. W of Tequisistlan, April 30, 1964, 3m, 4f (JTP); Tequisistlan, April 30, 1964, 20m, 11f (JTP); Oaxaca, June 29, 1957, 1m (USNM), Aug. 25, 1937, 1f (UKL); 29 mi. W of Tequisistlan, April 30, 1964, 15m, 8f (JTP); E of Tehuantepec, April 30, 1964, 1f (JTP); El Carmen, April 30, 1964, 4m (JTP); Arroyo del Chile, Aug. 20, 1959, 2f (HCC), 1m (USNM); Rio Grande, Totolapan, April 29, 1964, 1m, 1f (JTP); 12 mi. S of Chivela, Aug. 18, 1959, 1m (LACM); 4 mi. W of El Camaron, Aug. 20, 1959, 1m, 2f (USNM); 4 mi. SE of Tlacolulo, Aug. 21, 1959, 1f (USNM); Rio Hondo, April 30, 1964, 11m, 10f (JTP); Rio Astuta, April 30, 1964, 13m, 8f (JTP); Salina Cruz, July 24, 1951, 4m, 1f (JTP), 2m (UKL), 1m (AMNH), 1m (OU); 48 mi. W of Tehuantepec, Aug. 20, 1959,

7m, 7f (LACM), 1m, 2f (USNM); Tehuantepec, July 8, 1953, 2f (USNM), July 23, 1951, 2m, 1f (USNM), 1m, 1f (UMAA), 1m (LACM), 1m (JTP), 1m (HCC), 1f (UCS). Puebla: Tehuacan, July 18-25, 1937, 60m, 97f (UKL); 12 mi. SE of Matamoros, July 3, 1953, 9m, 13f (UKL); El Marquez, April 28, 1964, 31m, 30f (JTP); Izucar de Matamoros, April 27, 1964, 6m, 8f (JTP); Puebla, July 18, 1937, 2m, 7f (UKL), July 20, 1951, 1f, July 30, 1950, 3m, 1f (USNM). Queretaro: 5 mi. NW of Jalpan, July 24, 1970, 6m, 7f (TAMU), 1m (UCS). San Luis Potosi: Tamazunchale, June 21, 1953, 54m, 45f (UKL); 30 mi. NE of Ciudad del Maiz, June 19, 1953, 3m, 2f (UKL); El Banito, June 23, 1940, 1m (UKL); El Salto, June 15, 1956, 20m, 17f, June 17, 1955, 3m, 7f (UKL), Dec. 14, 1969, 1m, 1f (JTP); 2 mi. SE of Pedro Montoya, July 27-28, 1970, 3f (TAMU); stream, 10 mi. SE of Rio Verde, Nov. 25, 1972, 1m, 1f (UMAA); ditch, 0.7 mi. SE of Rio Verde, Nov. 25, 1972, 1f (UMAA); 5 mi. S of Rio Verde, July 28, 1970, 1f (TAMU); Ciudad Valles, April 28, 1930, 1f (UMAA), July 17, 1950, 1f (JTP), Aug. 8, 1951, 1m, 3f (USNM), 1f (UKL), 1f (CU). Sinaloa: Mazatlan, May, 1934, 1f (UKL); 72 mi. N of Mazatlan, Feb. 1, 1962, 1m, 5f (CAS); Arroyo de Zapotillo, 2 mi. E of Concordia, July 20, 1952, 22m, 24f (JTP); Concordia, April 20, 1964, 1m (JTP), July 8, 1964, 1m, 2f (CNC); Santa Lucia, April 20, 1964, 1m, 1f (JTP); 16 mi. S of Guamuchil, June 13, 1961, 2m, 1f (LACM); Rio del Fuerte, Agua Caliente, Feb. 20, 1957, 1m, (UMAA); 0.5 mi. W of El Alamo, Feb. 22, 1957, 1f (UMAA); Arroyo Sonolona, 18.5 mi.

E of Culiacan, April 2, 1955, 1f (UMAA); Choix, June 10, 1974, 5m, 5f (PDK); E of Concordia, June 6, 1975, 4m, 3f (JTP); Rio San Lorenzo, 31 mi. S of Culiacan, July 26, 1952, 4m, 3f (JTP); Sinaloa Presa, July 25, 1952, 1f (JTP); Rio Elota, 77 mi. S of Culiacan, July 26, 1952, 6m, 10f (JTP); El Quelite, Nov. 29, 1968, 7m, 8f (JTP); Rio Presidio, Villa Union Presidio, July 21, 1952, 10m, 15f (JTP); Rio Piaxtla, 48 mi. N of Mazatlan, July 27, 1952, 15m, 16f (JTP); Los Mayos, July 24, 1952, 12m, 11f (JTP); Rio Macorito, May 18, 1973, 1f (RET); Rio Piaxtla, 50 mi. N of Mazatlan, July 22, 1952, 2m, 2f (JTP); Rio Panuco, 38 mi. E of Mazatlan, Aug. 28, 1952, 5m, 13f (JTP); Rio Quelite, 23 mi. N of Mazatlan, July 22, 1952, 3m, 9f (JTP). Sonora: Rio Mayo, Salitral, Feb. 23, 1935, 5f (UKL); Tepopa S. Charibo, March 9, 1935, 1m (UKL); Rio Mayo, San Bernardo, Oct. 14, 1934, 14m, 11f (UKL); Alamos, July 25-Aug. 7, 1953, 2f (LACM), Aug. 26, 1959, 2f (LACM); Rio Cuchujaqui, near Alamos, Aug. 22, 1959, 7m, 8f (LACM); Rio Guirocoba, Guirocoba, March 31, 1973, 1m (RET); Arroyo de los Platanos, near Guirocoba, March 28, 1973, 1f, Dec. 21, 1970, 1m, 1f (RET); Arroyo Tarum, Feb. 15, 1973, 1m (RET); Arroyo San Pedro, San Pedro, Jan. 22, 1973, 1m, Feb. 28, 1973, 1f, April 11, 1973, 2m (RET); Arroyo Cuchujaqui, 8 mi. NW of Guirocoba, April 16, 1973, 1f, May 13, 1973, 1f, June 13, 1973, 1f (RET); Arroyo Agua Caliente, Agua Caliente, Feb. 13, 1973, 1m, 3f, April 1, 1973, 1f, April 4, 1973, 1m, April 6, 1973, 1f, May 12, 1973, 7m, 3f, June, 1973, 8m, 5f, Nov. 13, 1973, 2m (RET); Rio

Cuchujaqui, 7 mi. S of Alamos, July 25-Aug. 7, 1953, 2m, 1f (LACM); Arroyo Cuchajaqui, 9 mi. E of Alamos, Feb. 17, 1957, 2f (UMAA); small river, 9 mi. E of Sabino, June 5, 1975, 2m, 1f (JTP); Rio Cuchujaqui, 5 mi. E of Alamos, June 11, 1974, 10m (PDK); Rio Cuchujaqui, 7 mi. E of Alamos, June 12, 1961, 2m (LACM); Arroyo Cuchajaqui, Alamos, March 21, 1967, 3m, 6f (JTP); stream, Alamos, May 29, 1966, 6m, 6f (JTP); Arroyo Jaguari, Agua Colunte, May 10, 1973, 1f (RET). Tamaulipas: Liera, June 15, 1953, 2f (UKL); Villagran, Aug. 12, 1959, 2m, 1f (USNM), 1f (HCC); Rio Purificacion, Carmen, June 16, 1934, 3m, 2f (ISU); 5 mi. SSE of Gomez Farias, July 19-20, 1970, 1f (TAMU); Ciudad Victoria, July 14, 1950, 6m, 1f (USNM), 1m, 1f (HCC), Dec., 1910, 1f (USNM); San Jose, April, 1910, 1m, 2f (CAS); Rio Guayalejo, S of Ciudad Victoria, June 16, 1934, 4m, 1f (ISU); 2 mi. SE of Gomez Farias, July 20, 1970, 2m, 3f (TAMU); 5 mi. N of Ciudad Victoria, Nov. 5, 1936, 3m, 6f (UKL); 21 mi. N of Ciudad Victoria, July 19, 1970, 16m, 6f (TAMU). Veracruz: 10 mi. SE of Jalapa, June 29, 1953, 3m, 3f (UKL); Soledad, Jan. 14, 1899, 1m (holotype) (ISU), 1f (allotype) (ISU), 5m, 1f (paratypes) (USNM), 1m, 2f (paratypes) (ISU); stream, 3 mi. S of V. Alatorre, Jan. 8, 1974, 1m, 1f (JTP); Cordoba, May 13, 1946, 1m, 1f (AMNH); Rio Valle Nacional, 10 mi. N of Valle Nacional, Jan. 4, 1971, 1f (JTP); 8 mi. NE of Tlapacoyan, Aug. 16, 1959, 1f (USNM); jungle river, 19 mi. SE of Tantoyuca, Jan. 8, 1971, 2f (JTP); Rio Paso de Ovejas, Jan. 6, 1971, 2m, 2f (JTP); 3 mi. W of Paso de Ovejas, Aug. 17, 1959, 2f (USNM); 15 mi. NW

of Acayucan, June 18, 1958, 1m, 1f (JCS); Alvarado, July 28, 1951, 1m, 1f (USNM), 1m (AMNH). State unknown: Cuntlan del Rio Morelos, April 26, 1944, 2m, 2f (UKL).

NICARAGUA: 13 mi. N of Sn. Benito, July 11, 1965, 4m, 2f (USNM); small stream, 8 mi. N of Esteli, Dec. 23, 1969, 2m, 2f (JTP); small stream, near San Juan del Sur, Jan. 8, 1970, 26m, 9f (JTP); Rio Rapacales, W of Somoto, Dec. 22, 1969, 1m, 6f (JTP); 4 mi. W of Somoto, July 10, 1965, 1m (USNM); Madriz, July 9, 1957, 1f (USNM); Waspuk R., Musawas, Oct. 16-17, 1955, 2m (UCB); Riva, July 18, 1957, 2m, 1f (CSU), 2f (JTP); Esteli, July 9, 1957, 6m, 6f (USNM).

PANAMA: Penonome, 1m, 1f (UKL); Canal Zone, Feb. 10, 1939, 2m, 2f (USNM); Rio Chilibre, E of Panama, Jan. 2, 1969, 2m, 2f (JTP); San Carlos, Jan. 4, 1970, 1f (JTP); stream, near Remedios, Dec. 31, 1969, 1f (JTP).

UNITED STATES: Arizona: Cochise Co.: Huachuca Mts., Aug., 1934, 1m, 1f (USNM), 1m (BMNH), 1m (HCC).

VENEZUELA: San Esteban, Nov. 22, 1939, 1m (UKL); Santa Cruz, Aragua, Oct. 6, 1951, 1m (UKL).

Fig. 140. Color pattern of male T. trepidus, Sonora, Mexico.

Fig. 141. Color pattern of male T. trepidus, Oaxaca, Mexico.

Fig. 142. Color pattern of male T. trepidus, Sinaloa, Mexico.

Fig. 143. Color pattern of female T. trepidus, Baja California Sur, Mexico.

Fig. 144. Color pattern of female T. trepidus, Oaxaca, Mexico. Arrow indicates characteristic color pattern.

Fig. 145. Color pattern of female T. trepidus, Sinaloa, Mexico.

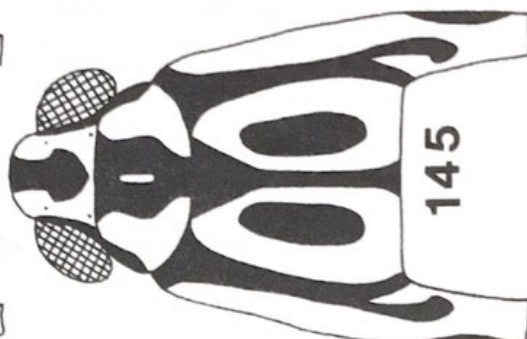


Fig. 142. Ventral view of female genitalia of *Staphylinus*, Mexico.

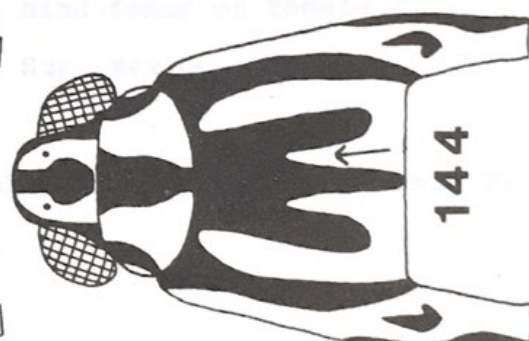


Fig. 141. Dorsal view of left hind femur of *Staphylinus*, Mexico.

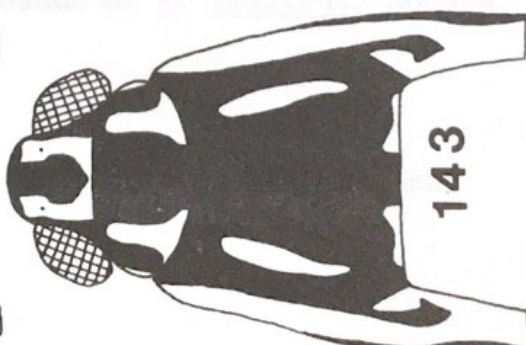
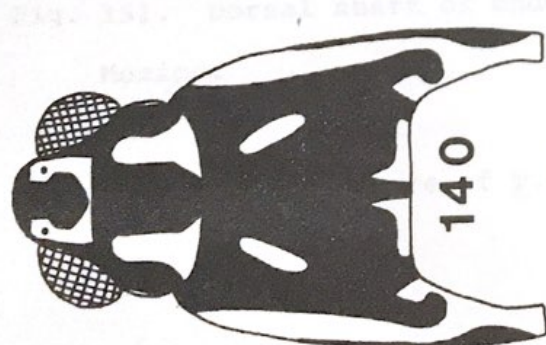


Fig. 143. Dorsal view of endosoma of *Staphylinus*, Mexico.




Fig. 146. Lateral view of left fore femur of male T. trepidus, Sinaloa, Mexico.




Fig. 147. Ventrite 7 of female T. trepidus, Sinaloa, Mexico.




Fig. 148. Dorsal view of left hind femur of female T. trepidus, Baja California Sur, Mexico.

Fig. 149. Dorsal profile of abdominal segment 8 of male T. trepidus, Sonora, Mexico.




Fig. 150. Left lateral view of abdominal segment 8 of male T. trepidus, Sonora, Mexico.




Fig. 151. Dorsal shaft of endosoma of T. trepidus, Sonora, Mexico.

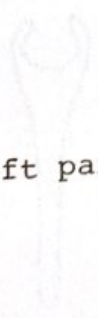


Fig. 152. Left paramere of T. trepidus, Sonora, Mexico.

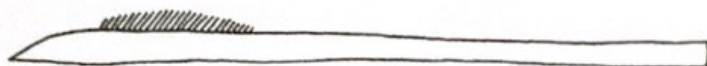


146



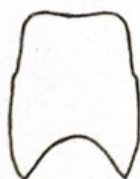
147

0.5 mm



148

0.5 mm



149



150

0.5 mm



151



152

0.1 mm

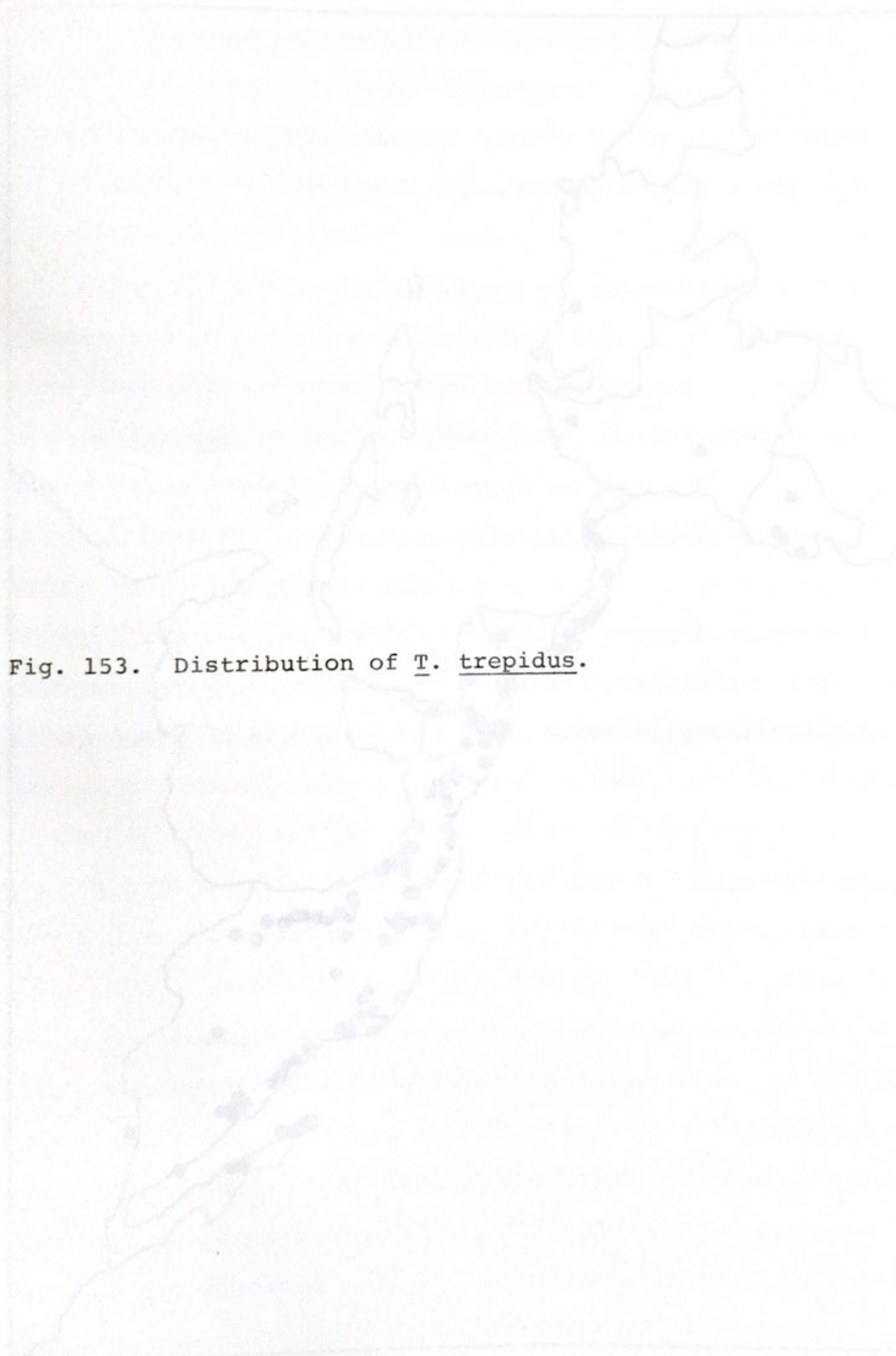
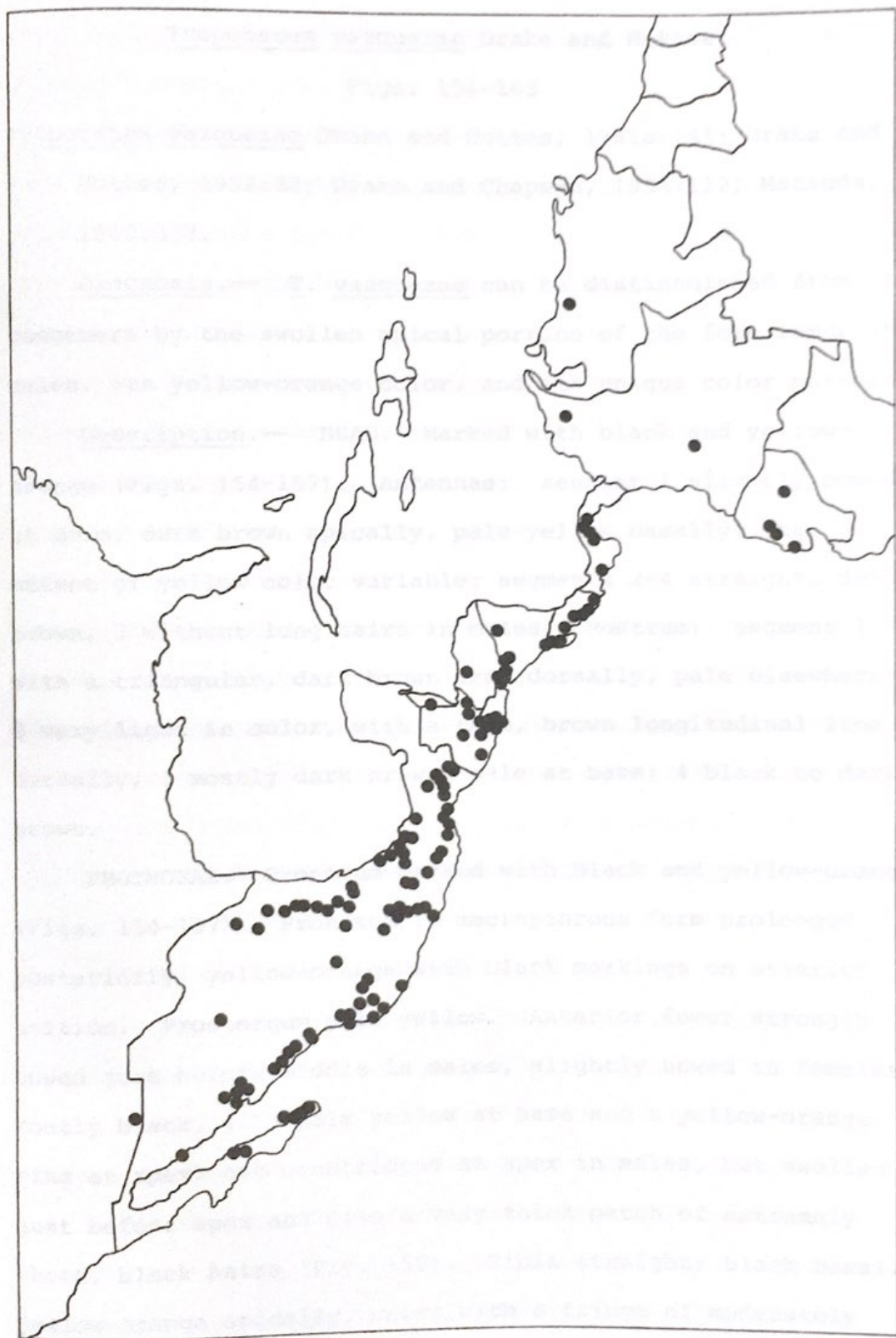


Fig. 153. Distribution of T. trepidus.



Trepobates vazquezae Drake and Hottes

Figs. 154-163

Trepobates vazquezae Drake and Hottes, 1951a:141; Drake and Hottes, 1952:38; Drake and Chapman, 1953:112; Matsuda, 1960:338.

Diagnosis.— T. vazquezae can be distinguished from its congeners by the swollen apical portion of the fore femur in males, its yellow-orange color, and its unique color pattern.

Description.— HEAD: Marked with black and yellow-orange (Figs. 154-157). Antennae: segment 1 slightly bowed at base, dark brown apically, pale yellow basally, the extent of yellow color variable; segments 2-4 straight, dark brown, 3 without long hairs in males. Rostrum: segment 1 with a triangular, dark brown area dorsally, pale elsewhere; 2 very light in color, with a thin, brown longitudinal line dorsally; 3 mostly dark brown, pale at base; 4 black to dark brown.

PROTHORAX: Pronotum marked with black and yellow-orange (Figs. 154-157). Pronotum in macropterous form prolonged posteriorly, yellow-orange with black markings on anterior portion. Prosternum pale yellow. Anterior femur strongly bowed just before middle in males, slightly bowed in females; mostly black, with pale yellow at base and a yellow-orange ring at apex; not constricted at apex in males, but swollen just before apex and with a very thick patch of extremely short, black hairs (Fig. 158). Tibia straight; black basally, yellow-orange apically, males with a fringe of moderately

long pubescence along outer lateral margin. Tarsus 1 and tarsus 2 black.

MESOTHORAX: Mesonotum with black and yellow-orange markings (Figs. 154-157), not prolonged posteriorly in females; without a patch of short, dark hairs along mesonotal-mesopleural line in females. A very small, yellow-orange mesopleural spot posterior to black postocular stripe of pronotum present in darker individuals (Figs. 154 and 156). Mesosternum yellow-orange, black color of mesopleuron sometimes extending onto anterior margin. Middle femur mostly black, with a yellow-orange, longitudinal stripe near base and a yellow-orange ring at apex; males with a thick ventral fringe of long, dark brown hairs; these hairs, at maximum length, approximately 70-80% of the diameter of the femur. Tibia black to dark brown; males with a single ventral row of short hairs along basal one-fourth which gradually decrease in length posteriorly; these hairs, at maximum length, approximately 25-35% of the diameter of the tibia. Tarsus 1 and tarsus 2 black to dark brown.

METATHORAX: Metanotum with black and yellow-orange markings, without a median patch of long hairs in females. Metasternum yellow-orange. Posterior femur black to dark brown with a yellow-orange stripe dorsally; without long hairs at base in females. Tibia, tarsus 1, and tarsus 2 dark brown.

ABDOMEN: Abdominal tergites mostly black, some marked with yellow-orange, especially in females; covered with gray-blue bloom, less extensive in females. Ventrites yellow-

orange, sometimes with dark brown laterally and along anterior margins in males; ventrite 7 in females without long hairs posteriorly. Connexival segments mostly yellow-orange with black anterior margins; lateral margins of segments 5 and 6 in males with moderately long, dark hairs; connexival segments without long hairs in females; connexiva not produced into spines at apex in females.

GENITALIA: Abdominal segment 8 of males with dorsal profile as in Fig. 159; with very short, thin, mostly pale pubescence ventrally (Fig. 160). Pygophore with very short, pale pubescence at middle and posteriorly. Dorsal shaft of endosoma shown in Fig. 161. Paramere as in Fig. 162.

Measurements.— HEAD: Transocular width of male 1.00-1.07 mm (1.03), female 1.02-1.07 mm (1.05). Interocular space of male 0.40-0.43 mm (0.41), female 0.41-0.45 mm (0.43). Antennae: male— 1) 1.08-1.15 mm (1.11), 2) 0.57-0.64 mm (0.60), 3) 0.56-0.63 mm (0.59), 4) 0.61-0.69 mm (0.65); female— 1) 0.86-0.97 mm (0.90), 2) 0.50-0.56 mm (0.54), 3) 0.51-0.63 mm (0.56), 4) 0.58-0.68 mm (0.62).

PROTHORAX: Pronotum: male— 0.89-0.95 mm (0.92) wide, 0.51-0.56 mm (0.54) long; female— 0.88-0.96 mm (0.92) wide, 0.41-0.50 mm (0.46) long. Anterior femur in male 1.52-1.67 mm (1.58), female 1.39-1.59 mm (1.48). Tibia in male 0.96-1.04 mm (1.00), female 0.93-1.12 mm (1.00). Tarsus 1 in male 0.07-0.10 mm (0.08), female 0.08-0.13 mm (0.11). Tarsus 2 in male 0.43-0.50 mm (0.45), female 0.46-0.54 mm (0.51).

MESOTHORAX: Mesonotum: male— 1.42-1.59 mm (1.49) wide, 0.91-1.00 mm (0.94) long; female— 1.76-2.00 mm (1.87) wide, 0.93-1.09 mm (1.06) long. Middle femur in male 1.88-2.00 mm (1.92), female 1.96-2.24 mm (2.11). Tibia in male 3.42-3.86 mm (3.64), female 3.66-4.06 mm (3.88). Tarsus 1 in male 1.02-1.29 mm (1.15), female 1.25-1.52 mm (1.35). Tarsus 2 in male 0.86-1.02 mm (0.96), female 0.98-1.12 mm (1.05).

METATHORAX: Posterior femur in male 2.52-2.71 mm (2.61), female 2.63-2.93 mm (2.81). Tibia in male 1.22-1.40 mm (1.33), female 1.36-1.50 mm (1.43). Tarsus 1 in male 0.53-0.62 mm (0.57), female 0.60-0.69 mm (0.64). Tarsus 2 in male 0.30-0.39 mm (0.34), female 0.32-0.40 mm (0.35).

SIZE: Length— male 3.59-3.86 mm (3.66), female 3.81-4.28 mm (4.09). Width— male 1.42-1.59 mm (1.49), female 1.76-2.00 mm (1.87).

Type Data.— All type material was collected from a saltwater lagoon at Acapulco, Guerrero, Mexico, on August 3, 1951, by C. J. Drake and F. C. Hottes. The male holotype, deposited in the Drake Collection, U.S. National Museum, was examined. Over 200 paratypes were also examined from the following collections: AMNH, BPBM, CAS, CNC, FMNH, HCC, ISU, JTP, LACM, MSU, OU, UCB, UCS, UKL, UMAA, UMSP, and USNM.

Taxonomy.— This species has not been confused with other species in the literature and can be easily identified by the swollen apical portion of the fore femur in males, the yellow-orange color, and the unique color pattern.

Intraspecific Variation.— The color pattern of T. vazquezae is somewhat variable (Figs. 154-157), but most specimens observed had the dark markings reduced or largely absent. A very small mesopleural spot posterior to the black postocular stripe of the pronotum is present in darker individuals (Figs. 154 and 156). Two-thirds of all specimens observed were macropterous, so this form is common.

Natural History.— Although not widely distributed, T. vazquezae may be locally abundant; Drake and Hottes (1951a) reported that it was abundant at Acapulco, Mexico. This species was first collected from a saltwater lagoon and one record given below is from a brackish bay; however, records also are given below for fresh-water rivers. Other species taken with T. vazquezae at the type locality include Limnogonus franciscanus, Metrobates denticornis, Rheumatobates sp., T. taylori, and T. trepidus (Drake and Hottes, 1951a). This species has been collected in April, June, July, August, and November. The life history of this water strider has not been investigated.

Distribution.— T. vazquezae is known only from four states of Mexico (Fig. 163). Previously known only from Guerrero, new records are listed below for Colima, Jalisco, and Nayarit.

Material Examined.— MEXICO: Colima: Santiago, Nov. 25, 1968, 4m, 1f (JTP). Guerrero: Acapulco, July 23, 1950, 1f (CNC), Aug. 3, 1951, 1m (holotype) (USNM), 67m, 72f (paratypes) (USNM), 1f (paratype) (MSU), 10f (paratypes)

(JTP), 4m, 1f (paratypes) (UMAA), 1m, 1f (paratypes) (UCB), 2m, 2f (paratypes) (OU), 4m (paratypes) (FMNH), 2f (paratypes) (UMSP), 4m, 3f (paratypes) (UCS), 2m, 1f (paratypes) (CNC), 2m, 5f (paratypes) (CAS), 1f (paratype) (ISU), 2m, 3f (paratypes) (AMNH), 2m, 3f (paratypes) (LACM), 2m, 1f (paratypes) (BPBM), 2m, 4f (paratypes) (HCC), 2m, 6f (paratypes) (UKL); lagoon, N of Pie de la Cuesta, April 26, 1964, 2m, 2f (CSU), 3m, 1f (JTP). Jalisco: brackish bay, Melaque, Nov. 20, 1968, 4m, 2f (JTP). Nayarit: jungle river, San Blas, Nov. 28, 1968, 4m, 7f (JTP); river, Santa Cruz, June 8, 1975, 4m, 4f (JTP).

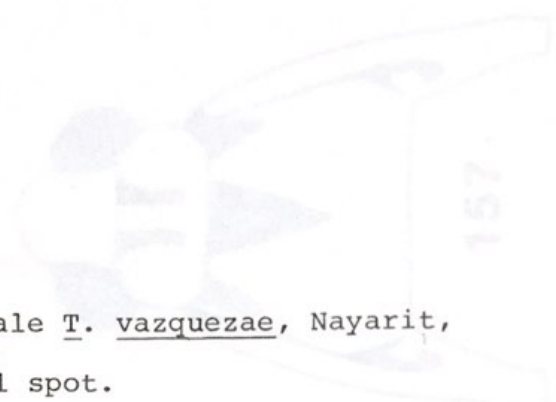


Fig. 154. Color pattern of male T. vazquezae, Nayarit, Mexico. MSP, mesopleural spot.

Fig. 155. Color pattern of male T. vazquezae, Guerrero, Mexico.

Fig. 156. Color pattern of female T. vazquezae, Nayarit, Mexico. MSP, mesopleural spot.

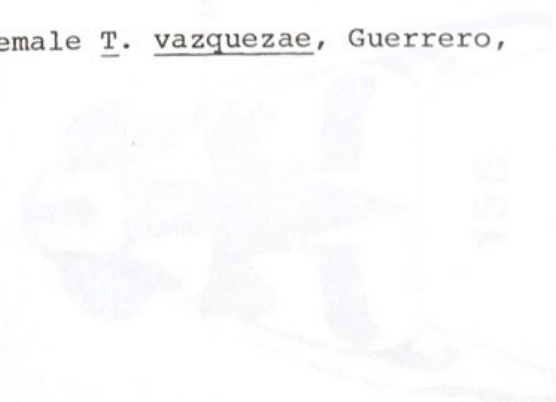
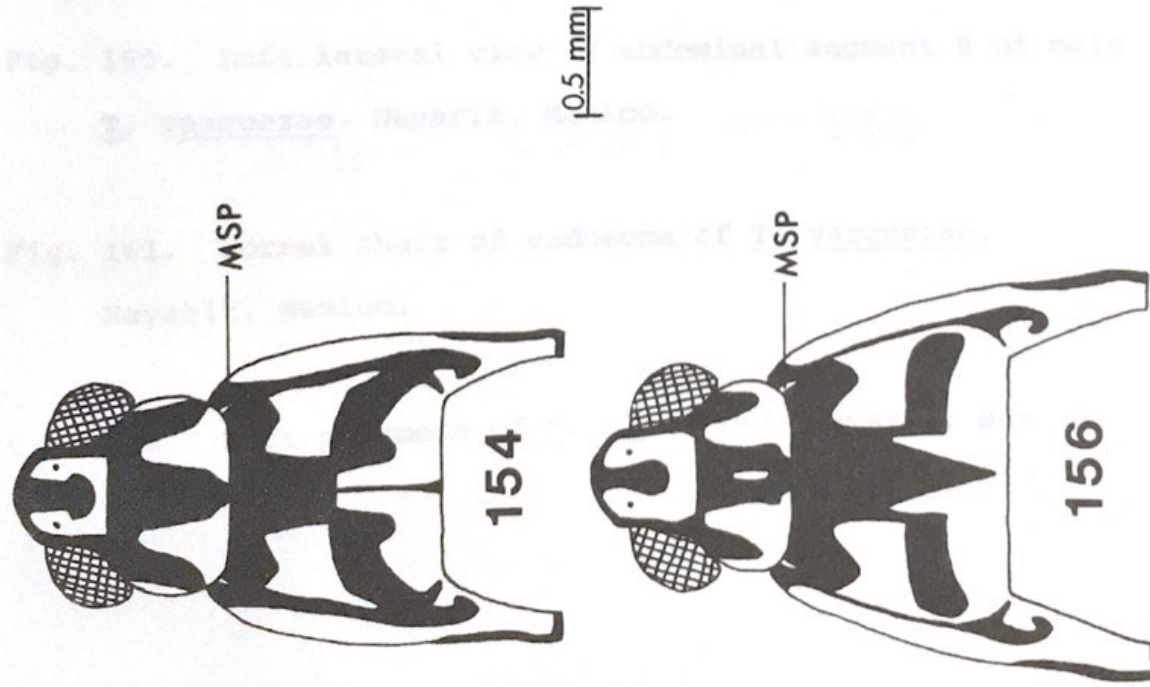
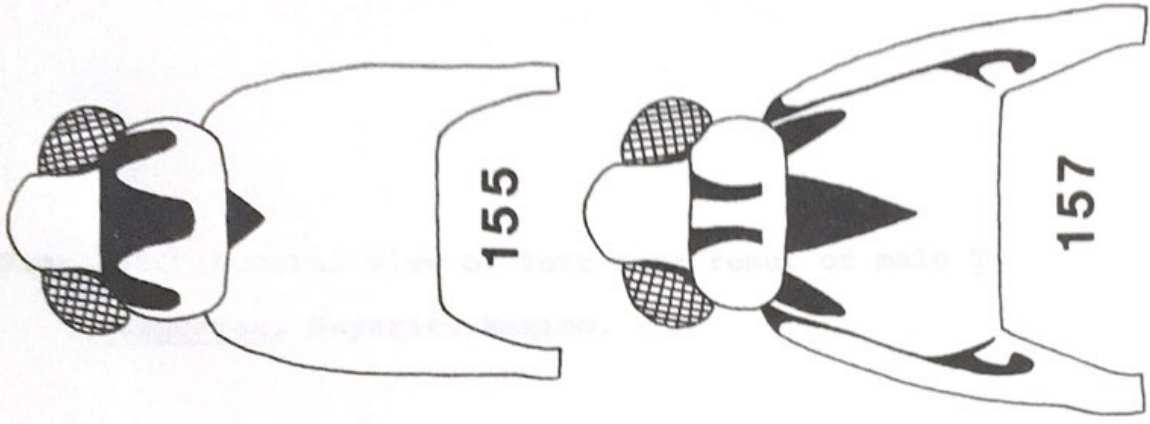


Fig. 157. Color pattern of female T. vazquezae, Guerrero, Mexico.





158

Fig. 158. Lateral view of left fore femur of male T.
vazquezae, Nayarit, Mexico.

Fig. 159. Dorsal profile of abdominal segment 8 of male T.
vazquezae, Nayarit, Mexico.

Fig. 160. Left lateral view of abdominal segment 8 of male
T. vazquezae, Nayarit, Mexico.

Fig. 161. Dorsal shaft of endosoma of T. vazquezae,
Nayarit, Mexico.

Fig. 162. Left paramere of T. vazquezae, Nayarit, Mexico.



161



162



158



159

0.5 mm



160



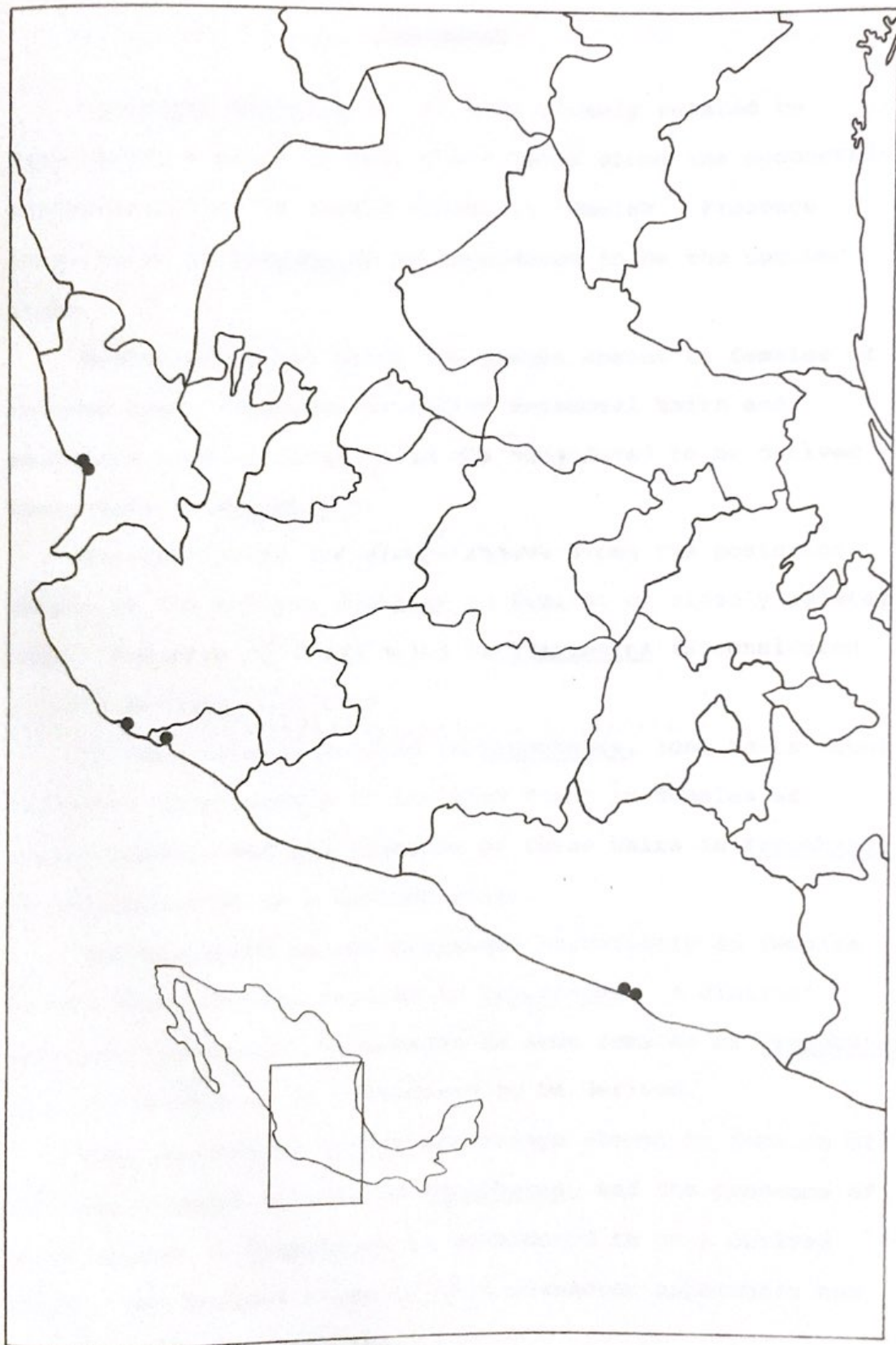
161

0.1 mm



162

Fig. 163. Distribution of T. vazquezae.



Phylogeny

Character Analysis.— In taxa closely related to Trepobates, a patch of very short hairs along the mesonotal-mesopleural line is always absent in females. Presence of these hairs in Trepobates is considered to be the derived state.

Median metanotal hairs are always absent in females of related taxa. Presence of median metanotal hairs and secondary loss of these hairs are considered to be derived characters in Trepobates.

Distinct hairs are always absent along the posterior margin of the seventh ventrite in females of closely related taxa. Presence of these hairs in Trepobates is considered to be a derived character.

In taxa closely related to Trepobates, long hairs along the basal inner margin of the hind femur in females are always absent, and the presence of these hairs in Trepobates is considered to be a derived state.

The mesonotum is not prolonged posteriorly in females of any taxon closely related to Trepobates. A distinct mesonotal projection is present in some females of Trepobates, and this condition is considered to be derived.

Long connexival spines are always absent in females of all taxa closely related to Trepobates, and the presence of these spines in Trepobates is considered to be a derived state. The derived state of this character apparently has arisen twice in Trepobates.

In all of the closely related taxa, long hairs are absent from the third antennal segment of males. Presence of long hairs on the third antennal segment of males is considered to be a derived state in Trepobates.

A constriction at the apex of the fore femur is absent in all males of related taxa, and presence of this constriction in males of Trepobates is considered to be the derived state. The derived state of this character apparently has arisen twice in Trepobates.

The fore femur in all males of closely related taxa is not distinctly swollen apically. Fore femur distinctly swollen apically is considered to be a derived character in Trepobates.

Light dorsal markings in most taxa closely related to Trepobates are yellow. Presence of orange dorsal markings in Trepobates is assumed to be the derived state.

A dense patch of extremely short hairs was absent from the ventral apex of the fore femur of all males of related taxa. The presence of these hairs on the fore femur of male Trepobates is considered to be derived.

Extremely long hairs on the eighth abdominal segment of males were absent in all closely related taxa, and the presence of these hairs in male Trepobates is assumed to be a derived character.

The above characters are considered to be of equal value in the construction of a hypothetical phylogeny for the species of Trepobates.

Proposed Phylogeny.— Based on the information concerning the ancestral and derived states of characters in the genus Trepobates, it is possible to postulate some of the characters of the progenitor of this genus, and to postulate the phylogenetic relationships among the extant species. Although a number of phylogenies can be proposed based on the characters stated above, the hypothetical phylogeny that follows (Fig. 164) was formulated in accordance with tenet 7 (see page 12) to produce the least number of character conflicts. The ancestor of Trepobates probably possessed the following characters: (1) a patch of very short hairs wanting along the mesonotal-mesopleural line of females; (2) median metanotal hairs wanting in females; (3) without distinct hairs along the posterior margin of the seventh ventrite in females; (4) long hairs along the basal inner margin of the hind femur absent in females; (5) without a distinct posterior mesonotal projection in females; (6) long connexival spines wanting in females; (7) without long hairs on the third antennal segment in males; (8) a constriction at the apex of the fore femur absent in males; (9) without the fore femur distinctly swollen apically in males; (10) light dorsal markings yellow; (11) a dense patch of extremely short hairs on the ventral apex of the fore femur wanting in males; and (12) extremely long hairs absent on the eighth abdominal segment of males.

Two lineages appear to have arisen from the progenitor of Trepobates, represented by hypothetical ancestor 1. One

lineage gave rise to T. vazquezae in which the dorsal markings became orange, and a distinct apical swelling and dense patch of extremely short hairs developed on the ventral apex of the fore femur in males. The second lineage gave rise to ancestor 2 in which median metanotal hairs developed in females.

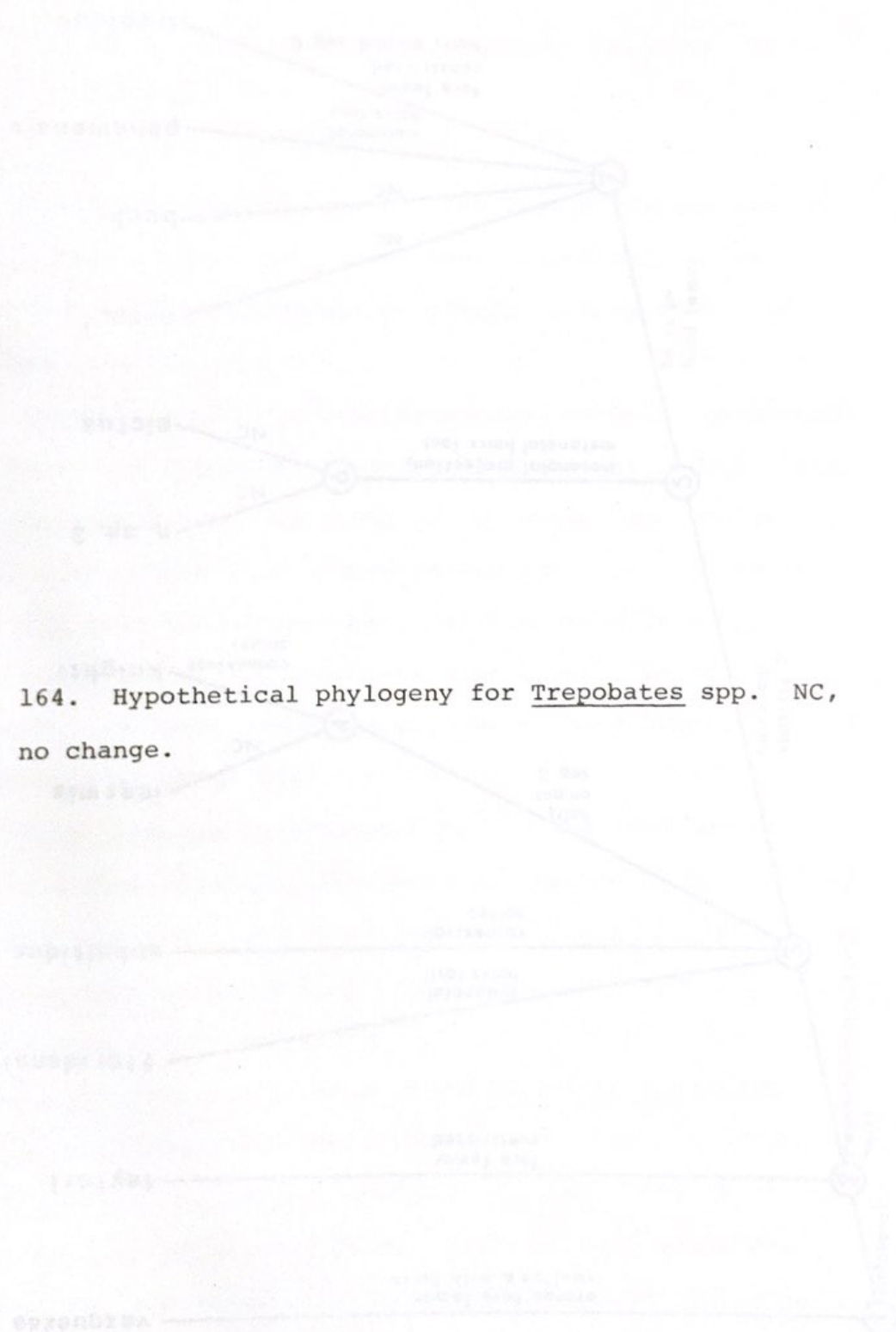
Ancestor 2 gave rise to two lineages. One of these produced the lineage represented by T. taylori, in which an apical constriction developed on the fore femur in males. Ancestor 3 is the product of the second lineage arising from ancestor 2 in which a patch of very short hairs developed along the mesonotal-mesopleural line in females.

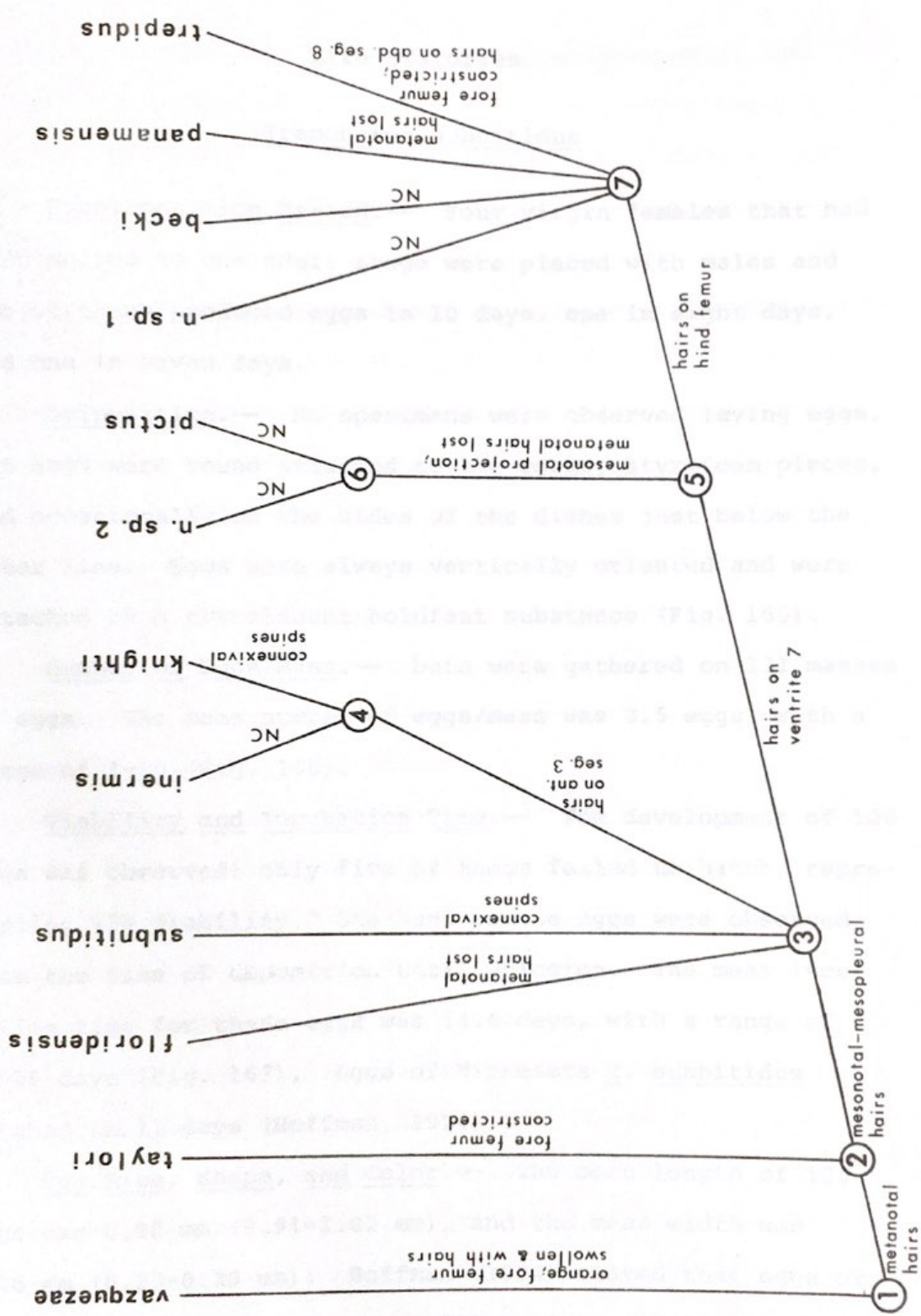
Ancestor 3 produced four lineages. One of these gave rise to a lineage in which the mesonotal hairs were lost; this lineage is represented by T. floridensis. A second lineage gave rise to T. subnitidus in which long connexival spines are present in females. The third lineage arising from ancestor 3 produced ancestor 4 in which long hairs developed on the third antennal segment in males. Two species, T. inermis and knighti, arose from ancestor 4. In the lineage giving rise to T. inermis, no changes were detected in the characters utilized for this analysis. T. knighti is characterized by the presence of long connexival spines in females, a derived state. The fourth lineage arising from ancestor 3 produced ancestor 5 in which distinct hairs developed along the posterior margin of the seventh ventrite in females.

Ancestor 5 gave rise to two lineages. The first of these produced ancestor 6 in which the median metanotal hairs were lost and a posterior mesonotal projection developed in females. T. pictus and n. sp. 2 arose from ancestor 6 with no apparent changes in the characters upon which this hypothetical phylogeny was based. The second lineage from ancestor 5 produced ancestor 7 in which long hairs developed on the basal inner margin of the hind femur in females.

Ancestor 7 produced four lineages. One of these gave rise to T. becki and one to n. sp. 1; both species appear to have arisen from ancestor 7 with no apparent changes in the characters used in this analysis. A third lineage produced T. panamensis in which the median metanotal hairs were lost in females. The fourth lineage from ancestor 7 gave rise to T. trepidus in which the fore femur became constricted apically in males and extremely long hairs developed on the eighth abdominal segment of males.

Fig. 164. Hypothetical phylogeny for Trepobates spp. NC,
no change.





Life Histories

Trepobates subnitidus

Preoviposition Period.— Four virgin females that had just molted to the adult stage were placed with males and two of these produced eggs in 10 days, one in eight days, and one in seven days.

Oviposition.— No specimens were observed laying eggs, but eggs were found attached to the corks, styrofoam pieces, and occasionally on the sides of the dishes just below the water line. Eggs were always vertically oriented and were attached by a translucent holdfast substance (Fig. 165).

Number of Eggs/Mass.— Data were gathered on 131 masses of eggs. The mean number of eggs/mass was 3.5 eggs, with a range of 1-10 (Fig. 166).

Viability and Incubation Time.— The development of 106 eggs was observed; only five of these failed to hatch, representing 95% viability. One hundred one eggs were observed from the time of deposition until eclosion. The mean incubation time for these eggs was 14.6 days, with a range of 13-16 days (Fig. 167). Eggs of Minnesota T. subnitidus hatched in 12 days (Hoffman, 1924).

Egg Size, Shape, and Color.— The mean length of 100 eggs was 0.95 mm (0.91-1.02 mm), and the mean width was 0.26 mm (0.23-0.30 mm). Hoffman (1924) stated that eggs of Minnesota T. subnitidus were 1.057 mm long and 0.264 mm wide. During the development of the eggs, no significant changes

in size were observed. The eggs were elongate-oval and slightly more pointed at the posterior end. The eggs remained basically straw-colored during their development except for the formation of certain spots of pigmentation (see below).

Egg Development.— During day 1 of development no significant changes were observed, but by day 2 the eggs had become somewhat granular in appearance. Days 3 and 4 of development were marked by the appearance of distinct yolk globules throughout the egg. By day 5 or 6 the yolk had mostly disappeared, and the red eyes and spots of red pigment (Fig. 168) began to appear. Hungerford (1919) figured an egg of what he called T. pictus, but this appears to be an egg of T. subnitidus since it shows a distribution of red spots very similar to the egg in Fig. 168. The eyes appeared first at the posterior end of the egg, but by day 6 or 7 had moved to the anterior end. The egg burster (Fig. 168) first became visible on day 7. During days 8-10, no significant developmental changes were observed. By days 11 and 12, the eyes and spots of pigment became noticeably darker, and a few of the eggs had developed sooty pigmentation at the posterior end. Some of the eggs hatched on day 13, but most continued developing until hatching on days 14-16. Just prior to hatching, the legs and antennae became visible, and the eggs developed sooty pigmentation over most of their surface.

Eclosion.— The emerging nymphs left the eggs through a

ventral split which extended anteroposteriorly for about one-half to two-thirds the length of the egg. The chorion with the attached egg burster usually was left protruding outside the egg but occasionally remained within the egg case.

Nymphs.— A nymph was examined immediately after eclosion to determine the location of the spots of red pigment observed during egg development (see above). Red spots were observed on the second and fourth antennal segments, at the apex of the front femora and tibiae, and at the apex of the middle femora. Immediately after eclosion the nymph was very lightly pigmented and the red spots were readily visible, but within a few hours pigmentation became much darker and the red spots could no longer be seen.

Hungerford (1919) observed red spots on the first, second, and fourth antennal segments of a first instar nymph and also noted that these spots soon became obscured. Data on the duration of each nymphal instar are presented in Table 1 (N=13). The mean duration and range of each instar were as follows: I— 5.3 days (5-6), II— 7.9 days (6-10), III— 7.8 days (6-9), IV— 7.6 days (7-9), and V— 9.9 days (8-11).

Hoffman (1924) presented the following means and ranges for the duration of each instar for Minnesota T. subnitidus: I— 7 days (5-9, N=15), II— 5.9 days (5-8, N=14), III— 7.9 days (5-12, N=11), IV— 9.3 days (8-10, N=9), and V— 10.6 days (8-12, N=6). The mean number of days required for completion of all nymphal stages in this study was 38.5 (35-41, N=13). Six Minnesota specimens raised by Hoffman

(1924) completed all nymphal instars in 36-42 days, with a mean of 39 days. Measurements of antennal and leg segments of exuviae from each instar are given in Table 2.

First Instar: Pattern of dark brown markings present on head (Fig. 169). Antennae: segment 1 light in color, with a single long, dark hair at dorsal apex; 2 light brown, with a single long, dark hair at dorsal apex; 3 pale basally, light brown apically; 4 light brown. Rostrum light brown, fourth segment darker. Paired dark markings on pronotum (Fig. 169). Propleuron with a patch of light brown pigment. All legs light brown. Mesonotum with a large pair of brown spots along anterior margin, these spots extending onto mesopleuron. Mesopleuron with a large brown area posteriorly. Metanotum with a pair of dark brown spots. Meta-acetabulum with a brown patch on dorsum and sides. Each abdominal tergite with a pair of rectangular brown spots.

Second Instar: Head with dark brown markings (Fig. 170) somewhat variable. All antennal segments brown, 1 and 2 with a single short, dark hair at dorsal apex. Segment 1 of rostrum dark brown at base, lighter apically; 2 and 3 light brown; 4 dark brown. Pronotum with paired dark markings (Fig. 170). Propleuron with a very small brown spot. All legs brown. Mesonotum with light and dark markings (Fig. 170). Mesosternum, mesopleuron, and metanotum similar to first instar. Meta-acetabulum with a brown patch laterally. Abdominal tergites 1 and 2 with a pair of rectangular brown spots, remaining tergites with pairs of transverse dark

brown marks. Each abdominal tergite also with large, paired pale areas.

Third Instar: Head with variable dark brown markings (Fig. 171). Antennae: basal two-thirds of segment 1 pale, apical one-third brown, and with a single short, dark hair at dorsal apex; 2 brown, also with a hair as in segment 1; 3 brown except at base; 4 brown. Segment 1 of rostrum with a triangular brown spot dorsally; 2 mostly pale; 3 light brown; 4 dark brown. Pronotum with brown markings as in Fig. 171, these somewhat variable. Propleuron as in second instar. Fore femur pale; tibia brown at base and apex, pale in middle; tarsus brown. Mesonotal pattern as in Fig. 171, the inner portion of the dark brown markings often absent, forming C-shaped markings. Mesosternum and mesopleuron similar to first instar. Middle femur with two small brown spots dorsally, pale except at base and apex; tibia and tarsus brown. Metanotum with a pair of large, dark brown spots, light brown in middle. Meta-acetabulum as in second instar. Hind femur with three small brown spots dorsally, pale except at base and apex; tibia and tarsus brown. Abdominal tergites similar to second instar.

Fourth Instar: Dark brown markings on head (Fig. 172) somewhat variable. Antennae similar to third instar except for absence of short, dark hairs on segments 1 and 2. Rostrum as in third instar. Pronotal markings as in Fig. 172. Propleuron with very small brown spots posteriorly. Fore legs as in third instar. Mesonotum marked with light

and dark brown areas (Fig. 172), the dark brown areas sometimes modified as described for the third instar. Mesosternum and mesopleuron similar to first instar. Middle legs and metanotum similar to third instar. Meta-acetabulum as in second instar. Hind legs like third instar except for more extensive brown color at apex of femur. Abdominal tergites 1 and 2 with small, dark brown, and triangular markings. Remaining tergites similar to second instar.

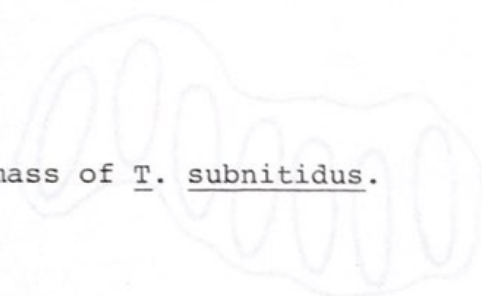
Fifth Instar: Head with dark brown markings (Fig. 173) somewhat variable. Antennae: segment 1 pale along basal one-third to one-half, brown elsewhere; 2 brown; 3 brown except for pale base; 4 brown. Rostrum similar to third instar except for darker brown color and segment 4 black. Pronotum marked as in Fig. 173. Propleuron as in fourth instar. Fore legs usually as in fourth instar, but femur sometimes darker apically and tarsus entirely brown. Mesonotal pattern as in Fig. 173, often with modifications noted for third instar. Middle femur pale except for brown stripes along anterior and dorsal margins; tibia and tarsus brown. Metanotum with large pairs of dark brown spots and pale areas, light brown at center and sides. Meta-acetabulum with dark brown spots dorsally and laterally. Hind legs similar to fourth instar. Abdominal tergites 1-3 with transverse, paired dark markings, remaining tergites with small longitudinal dark markings and paired pale areas.

Ecdysis.— This process was initiated by the splitting

of the cuticle at ecdysial lines on the head, dorsal midline of the thorax, and sometimes on the first few abdominal segments. The head emerged first, followed by the thorax, abdomen, and appendages. Some individuals had difficulty completely freeing their appendages from the exuviae, while others died during molting. The latter bugs managed to withdraw their bodies from the exuviae but could not free their appendages. Kaufmann (1971) stated that some individuals of Gerris rufoscutellatus he reared experienced similar ecdysial failures.

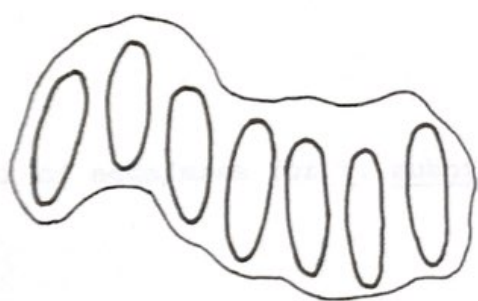
Fig. 155. Egg mass of G. subnigrus.

Fig. 165. Egg mass of T. subnitidus.



165

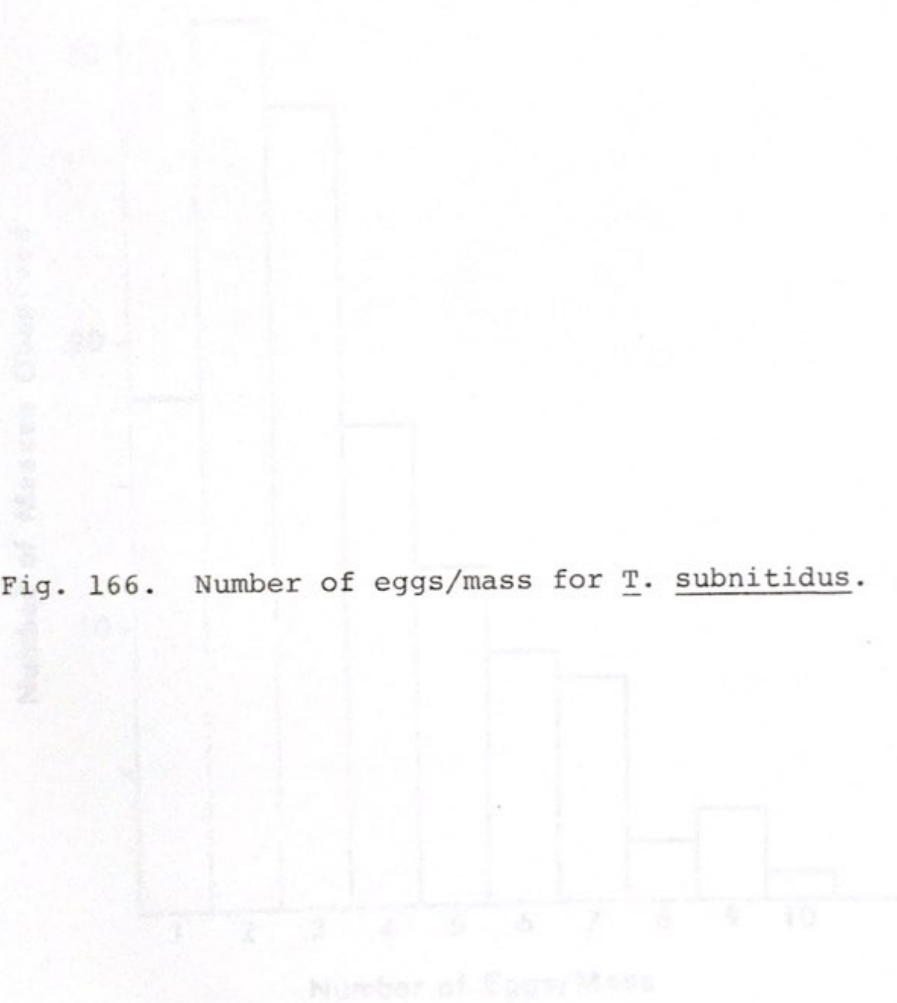
10 mm



165

| 1.0 mm |

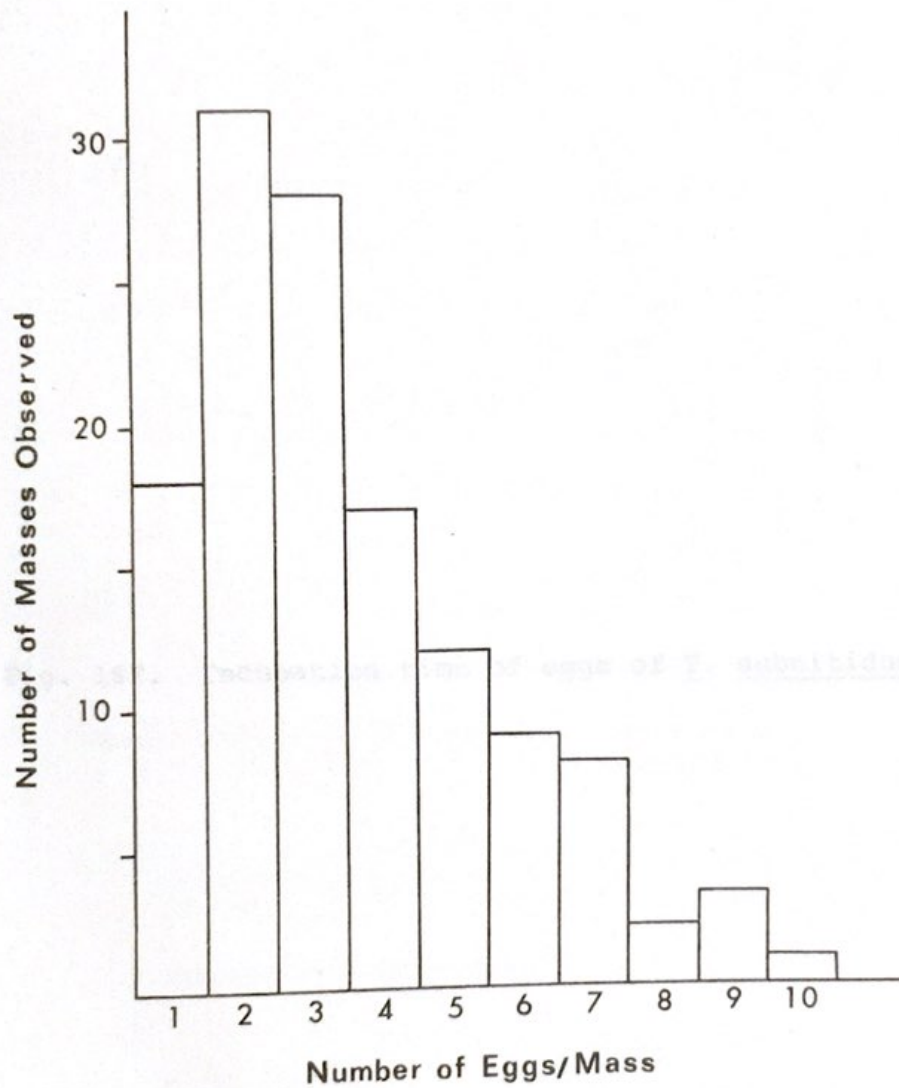
Fig. 166. Number of eggs/mass for T. subnitidus.



N = 131 masses

$\bar{x} = 3.5$ eggs/mass

range = 1-10 eggs/mass



N= 131 masses

\bar{x} = 3.5 eggs/mass

range= 1-10 eggs/mass

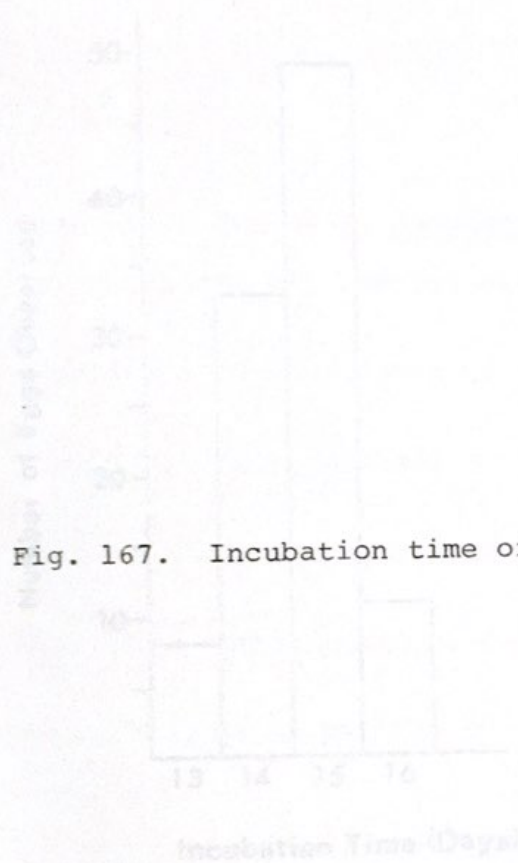
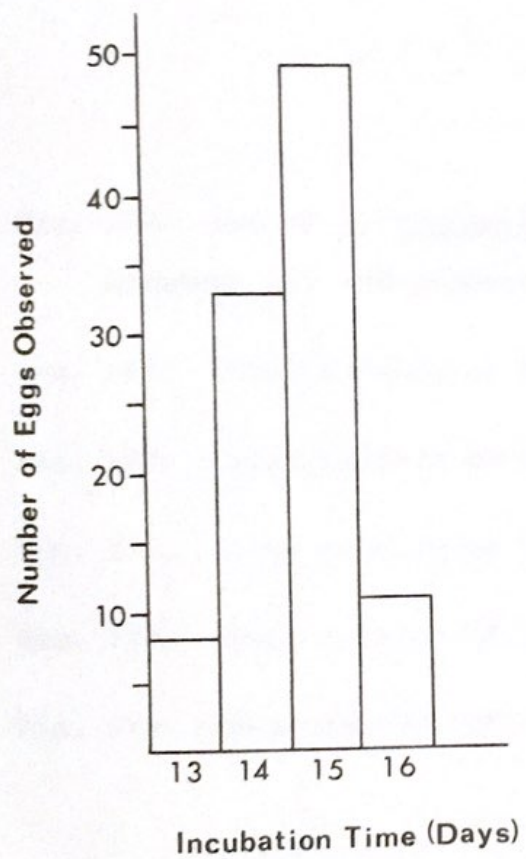


Fig. 167. Incubation time of eggs of T. subnitidus.

No. 101 eggs

5% 14-16 days

range 13-16 days



N= 101 eggs

\bar{x} = 14.6 days

range= 13-16 days




Fig. 168. Egg of T. subnitidus, day 9. E, eye; EB, egg burster; RP, red pigment.

Fig. 169. Color pattern of instar I of T. subnitidus.

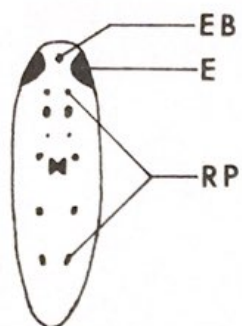
Fig. 170. Color pattern of instar II of T. subnitidus.

Fig. 171. Color pattern of instar III of T. subnitidus.

Fig. 172. Color pattern of instar IV of T. subnitidus.

Fig. 173. Color pattern of instar V of T. subnitidus.





168



169



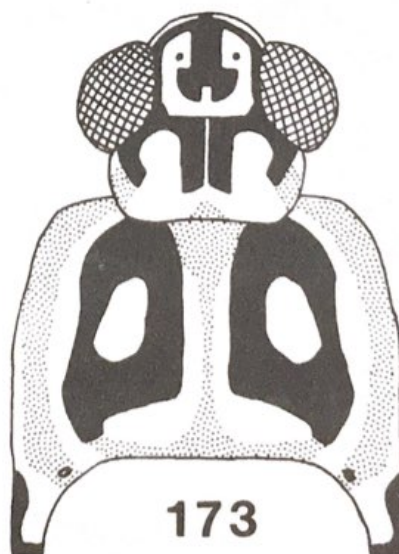
170



171



172



173

0.5 mm

Date Recd	Instar					Total	Sex
	I	II	III	IV	V		
2481	5	9	7	7	11	39	F
2472	5	9	8	7	10	39	F
2474	5	8	8	8	8	37	F
2426	5	6	8	8	8	35	M
2404	5	10	6	8	10	39	F
2407	5	8	6	7	9	35	M

Table 1. Duration (in days) of nymphal instars of seven male and six female T. subnitidus.

2481	5	9	7	7	11	39	F
2472	5	9	8	7	10	39	F
2474	5	8	8	8	8	37	F
2426	5	6	8	8	8	35	M
2404	5	10	6	8	10	39	F
2407	5	8	6	7	9	35	M
mean	5.3	7.9	7.5	7.6	9.2	38.3	
range	5-6	6-10	6-8	7-8	8-11	35-41	

<u>Specimen</u>	<u>Instar</u>					Total	Sex
	I	II	III	IV	V		
SN21	5	9	7	7	11	39	f
SN22	5	8	8	7	10	38	f
SN24	5	8	8	8	8	37	f
SN25	5	6	8	8	9	36	m
SN26	5	10	6	8	10	39	f
SN27	5	6	8	7	9	35	m
SN28	5	7	8	7	10	37	m
SN29	5	8	8	9	11	41	m
SN30	5	8	9	8	11	41	m
SN31	6	8	8	7	11	40	f
SN32	5	8	8	7	9	37	f
SN33	6	8	8	8	10	40	m
SN34	6	9	7	8	10	40	m
mean	5.3	7.9	7.8	7.6	9.9	38.5	
range	5-6	6-10	6-9	7-9	8-11	35-41	

Table 2. Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female T. subnitidus exuviae.

Segment	Male	Female
antennal 1	0.11-0.14 (0.13)	0.15-0.18 (0.17)
antennal 2	0.09-0.11 (0.10)	0.10-0.13 (0.11)
antennal 3	0.05-0.07 (0.06)	0.07-0.09 (0.08)
antennal 4	0.16-0.19 (0.18)	0.21-0.24 (0.23)
antennal 5	0.40-0.44 (0.42)	0.51-0.53 (0.52)
leg 1	0.20-0.23 (0.22)	0.27-0.31 (0.29)
leg 2	0.18-0.21 (0.20)	0.20-0.23 (0.22)
leg 3	0.12-0.14 (0.13)	0.14-0.16 (0.15)
leg 4	0.53-0.56 (0.54)	0.68-0.74 (0.71)

<u>Segment</u>	<u>Instar</u>				
	I	II	III	IV	V
antennal 1	0.11-0.13 (0.12)	0.15-0.19 (0.17)	0.24-0.28 (0.26)	0.37-0.42 (0.39)	0.56-0.63 (0.60)
antennal 2	0.06-0.08 (0.07)	0.08-0.11 (0.10)	0.12-0.15 (0.14)	0.20-0.23 (0.21)	0.30-0.37 (0.33)
antennal 3	0.05-0.07 (0.06)	0.07-0.09 (0.08)	0.11-0.15 (0.12)	0.11-0.20 (0.16)	0.23-0.31 (0.28)
antennal 4	0.16-0.19 (0.18)	0.21-0.23 (0.22)	0.27-0.29 (0.28)	0.35-0.38 (0.37)	0.45-0.51 (0.48)
total ant.	0.40-0.44 (0.42)	0.53-0.59 (0.56)	0.76-0.84 (0.80)	1.07-1.18 (1.13)	1.62-1.80 (1.69)
fore femur	0.20-0.22 (0.21)	0.27-0.31 (0.29)	0.41-0.44 (0.42)	0.58-0.64 (0.60)	0.84-1.01 (0.93)
fore tibia	0.18-0.21 (0.20)	0.25-0.28 (0.27)	0.32-0.39 (0.36)	0.46-0.52 (0.51)	0.67-0.81 (0.73)
fore tarsus	0.12-0.14 (0.13)	0.14-0.16 (0.15)	0.19-0.21 (0.20)	0.29-0.32 (0.30)	0.41-0.46 (0.43)
fore leg total	0.52-0.55 (0.54)	0.66-0.75 (0.71)	0.94-1.01 (0.98)	1.33-1.45 (1.39)	1.91-2.29 (2.10)

<u>Segment</u>	<u>Instar</u>				
	I	II	III	IV	V
middle femur	0.39-0.42 (0.41)	0.56-0.59 (0.57)	0.77-0.82 (0.79)	1.04-1.13 (1.07)	1.42-1.62 (1.51)
middle tibia	0.69-0.71 (0.70)	0.92-0.96 (0.95)	1.30-1.37 (1.33)	1.80-1.91 (1.87)	2.49-2.90 (2.66)
middle tarsus	0.52-0.55 (0.53)	0.66-0.70 (0.68)	0.83-0.92 (0.88)	1.13-1.25 (1.18)	1.51-1.86 (1.66)
middle leg total	1.62-1.66 (1.64)	2.14-2.23 (2.20)	2.90-3.08 (3.00)	3.97-4.26 (4.12)	5.45-6.38 (5.83)
hind femur	0.39-0.42 (0.40)	0.55-0.60 (0.59)	0.83-0.87 (0.84)	1.19-1.30 (1.22)	1.71-2.00 (1.82)
hind tibia	0.32-0.34 (0.33)	0.39-0.44 (0.42)	0.52-0.56 (0.55)	0.70-0.75 (0.72)	0.96-1.13 (1.01)
hind tarsus	0.25-0.27 (0.26)	0.30-0.34 (0.32)	0.38-0.41 (0.40)	0.46-0.55 (0.51)	0.64-0.78 (0.71)
hind leg total	0.97-1.03 (1.00)	1.27-1.37 (1.33)	1.76-1.85 (1.79)	2.38-2.61 (2.46)	3.36-3.91 (3.53)

Trepobates knighti

Preoviposition Period.— Three virgin females that had recently molted to the adult stage were placed with males and all produced eggs five days later.

Oviposition.— This process was very similar to that observed for T. subnitidus, and egg masses were deposited in the same manner as those of T. subnitidus (Fig. 165).

Number of Eggs/Mass and Fecundity.— The mean number of eggs/mass was 2.2 for the 202 egg masses examined with a range of 1-8 (Fig. 174). The mean number of eggs/mass was distinctly smaller than that of T. subnitidus (3.5). Observations were made on the fecundity of six females which produced the following number of eggs in the given number of days: 37 (21 days), 47 (17 days), 62 (30 days), 68 (34 days), 79 (21 days), and 95 (45 days).

Viability and Incubation Time.— The development of 122 eggs was followed and 116 (95%) hatched. The mean incubation time of 116 eggs was 15.8 days (12-20 days) (Fig. 175), somewhat longer than for T. subnitidus (14.6 days).

Egg Size, Shape, and Color.— The mean length of 100 eggs was 0.96 mm (0.89-1.02 mm), and the mean width was 0.28 mm (0.25-0.33 mm). No significant changes in egg size were observed during development. Egg shape and color were similar to T. subnitidus except for differences in the development of pigmented areas (see below).

Egg Development.— No significant changes occurred during day 1, but yolk globules appeared on day 2 and were

still visible on day 5. The time of appearance of the red eyes and spots of red pigment (Fig. 176) was somewhat variable. These features became visible at the posterior end on days 6-9 but moved to the anterior end in 24-48 hours. Some eggs showed three pairs of red spots (Fig. 176) while others showed only two pairs; in the latter eggs the posterior pair of spots was not visible. The egg burster was first visible on day 9 but did not appear on some eggs until days 10-12. The hatching time was quite variable (12-20 days), but the latter days of development of all eggs were marked by a darkening of the eyes and spots, the development of sooty pigmentation, and the appearance of the legs and antennae.

Eclosion.— This process was similar to that of T. subnitidus except that many of the nymphs could not break the surface film after hatching from the egg. These nymphs swam beneath the surface for several hours before dying.

Nymphs.— Newly hatched nymphs were examined to determine the location of the spots of red pigment, and single spots were seen on the second and fourth antennal segments. Data on the duration of each nymphal instar are presented in Table 3 (N=11). The mean duration and range of each instar were as follows: I— 7.3 days (6-8), II— 5.5 days (4-8), III— 6.7 days (5-10), IV— 9.4 days (7-13), and V— 14.2 days (12-18). The mean number of days required for completion of all nymphal stages was 43.1 (37-50, N=11). Antennal and leg segment measurements of exuviae from each instar are given in Table 4.

First Instar: Pattern of dark brown markings on head shown in Fig. 177. Antennae: segment 1 pale, with a single long, dark hair at dorsal apex; 2 light brown, with a hair similar to segment 1; 3 pale at base, light brown apically; 4 light brown. Rostrum light brown, segment 4 darker. Paired dark markings on pronotum (Fig. 177). Propleuron with a patch of brown pigment. All legs light brown. Mesonotum with a large pair of dark markings (Fig. 177); mesosternum with a small pair of brown spots along anterior margin, these spots extending onto mesopleuron. Mesopleuron with a large brown area posteriorly. Metanotum with a pair of dark brown spots. Meta-acetabulum with a brown patch dorsally and laterally. Abdominal tergites 1 and 2 with a single pair of transverse dark markings, remaining tergites with double pairs of transverse dark marks.

Second Instar: Head with dark markings (Fig. 178) somewhat variable. Antennae: segment 1 brown except basally; 1 and 2 with a single short, dark hair at dorsal apex; 2 brown; 3 brown with a small pale area basally; 4 brown. Segment 1 of rostrum with a triangular brown spot dorsally, 2 mostly pale, 3 brown, 4 dark brown. Pronotum with paired markings (Fig. 178) somewhat variable. Propleuron with a very small brown spot. All legs mostly brown. Mesonotum with light and dark brown markings (Fig. 178). Mesosternum, mesopleuron, and metanotum similar to first instar. Meta-acetabulum with a large brown spot laterally and a very small spot dorsally. Abdominal tergites 1 and 2 with paired brown spots, remaining

tergites with paired, transverse, and very thin brown markings. Each abdominal tergite also with large, paired pale areas.

Third Instar: Head with dark brown markings (Fig. 179) variable. Antennae: basal two-thirds of segment 1 pale, apical one-third brown, and with a single short, dark hair at dorsal apex; 2 brown, also with a hair as in segment 1; 3 brown except at base; 4 brown. First segment of rostrum with a dorsal, triangular brown spot; 2 mostly pale; 3 light brown; 4 dark brown. Pronotal markings as in Fig. 179. Propleuron as in second instar. Fore femur pale, tibia and tarsus brown. Mesonotal pattern shown in Fig. 179, the inner portion of the dark brown markings often absent, forming C-shaped markings. Mesosternum and mesopleuron similar to first instar. Middle femur light brown, with one brown spot near dorsal apex; tibia and tarsus brown. Metanotum with a pair of brown spots, light brown at middle, pale elsewhere. Meta-acetabulum as in second instar. Hind femur with three small brown spots dorsally, darker at base and apex; tibia and tarsus brown. Abdominal tergites similar to second instar.

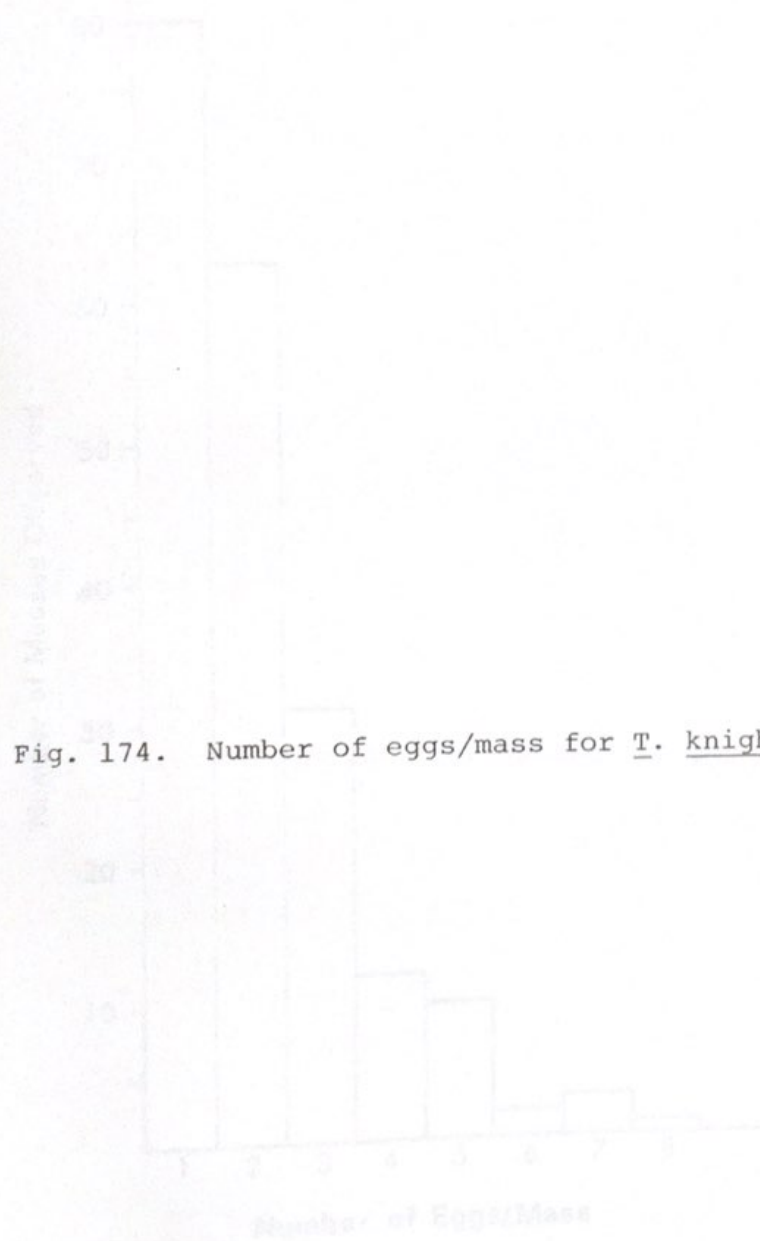
Fourth Instar: Dark brown markings on head (Fig. 180) variable. Antennae similar to third instar except for absence of short, dark hairs on segments 1 and 2. Rostrum as in third instar. Pronotal markings as in Fig. 180. Propleuron with a very small brown spot posteriorly. Fore femur with brown stripe along posterior margin; tibia mostly

light brown; tarsus brown. Mesonotum marked with light and dark brown areas (Fig. 180), the dark brown areas occasionally modified as described for the third instar. Mesosternum and mesopleuron similar to first instar. Middle femur with brown stripes along dorsal and posterior margins; tibia and tarsus brown. Metanotum similar to third instar. Meta-acetabulum as in second instar. Hind legs like third instar except for more extensive brown color at apex of femur. Abdominal tergites similar to second instar except brown spots on posterior tergites almost absent.

Fifth Instar: Head marked with dark brown (Fig. 181), markings somewhat variable. Antennae: basal one-half of segment 1 pale, apical one-half brown; 2 brown; 3 brown except for small pale area at base; 4 brown. Rostrum similar to third instar except for darker brown color and fourth segment black. Pronotal markings shown in Fig. 181. Propleuron as in fourth instar. Fore legs similar to fourth instar. Mesonotal pattern as in Fig. 181. Mesosternum and mesopleuron similar to first instar. Middle legs similar to fourth instar. Metanotum similar to third instar. Meta-acetabulum with dark brown spots dorsally and laterally. Hind legs similar to third instar. Abdominal tergites similar to fourth instar.

Ecdysis.— T. knighti molted in a manner similar to subnitidus except that many more knighti nymphs experienced difficulty shedding their exuviae.

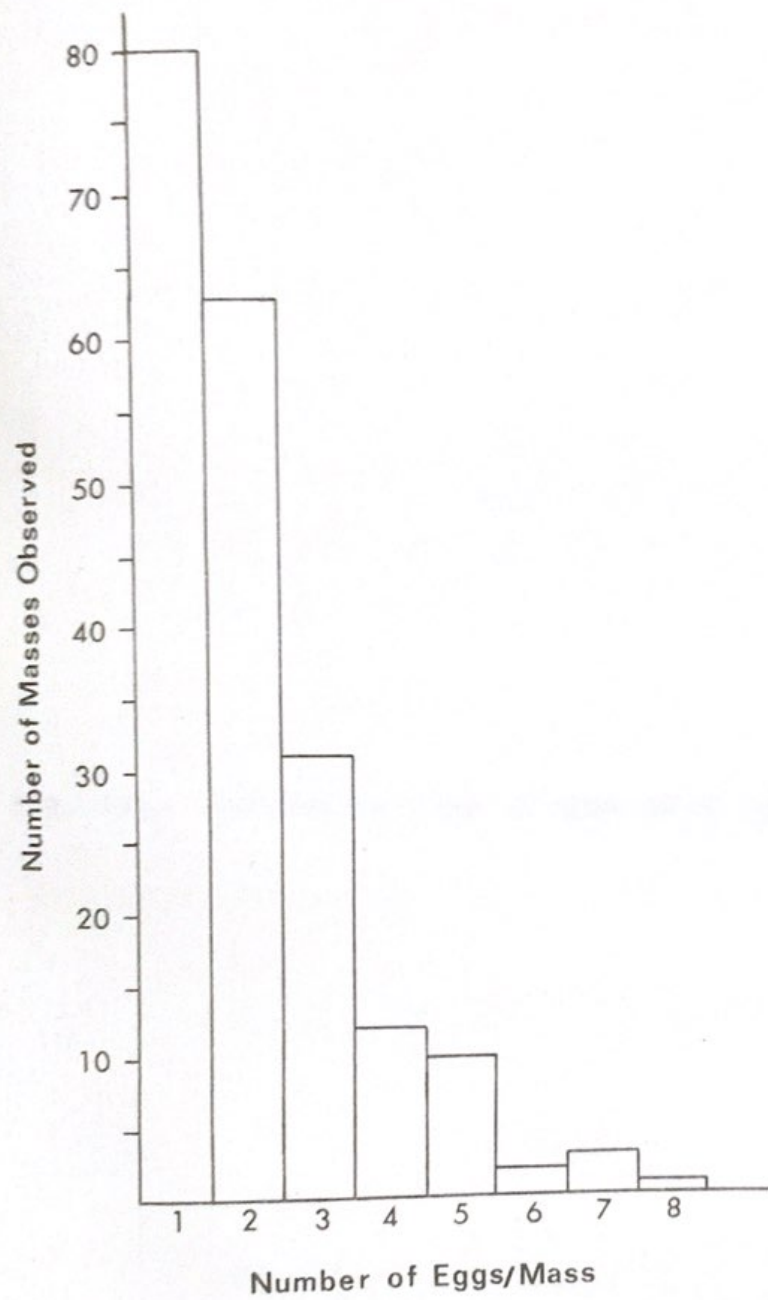
Fig. 174. Number of eggs/mass for T. knighti.



No 202 masses

$\bar{x} = 2.2$ eggs/mass

range = 1-8 eggs/mass



N= 202 masses

\bar{x} = 2.2 eggs/mass

range= 1-8 eggs/mass

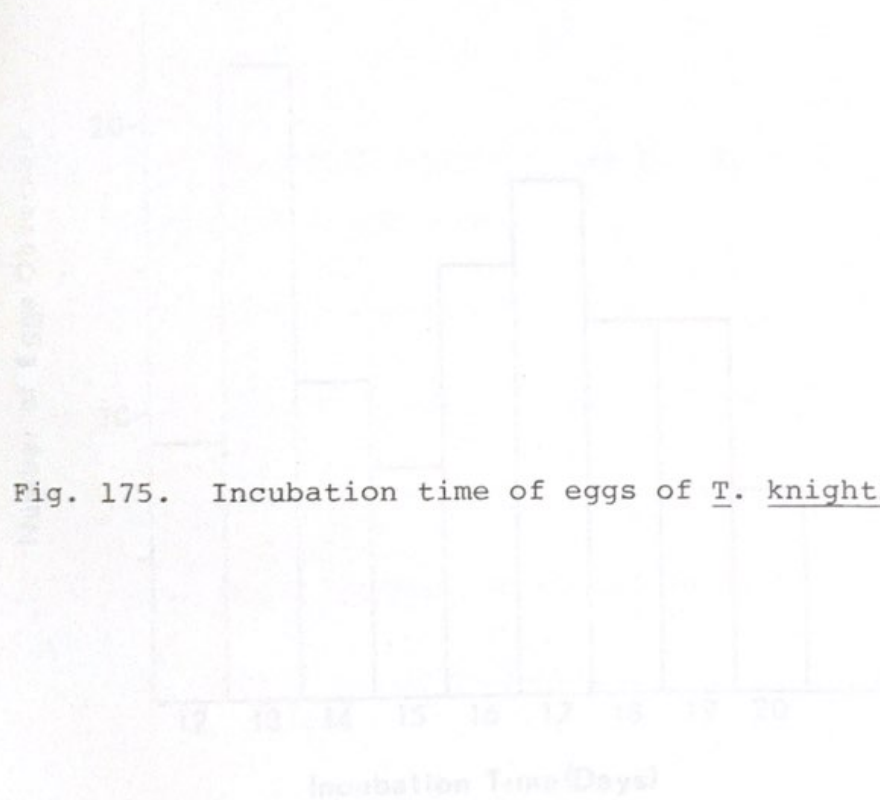
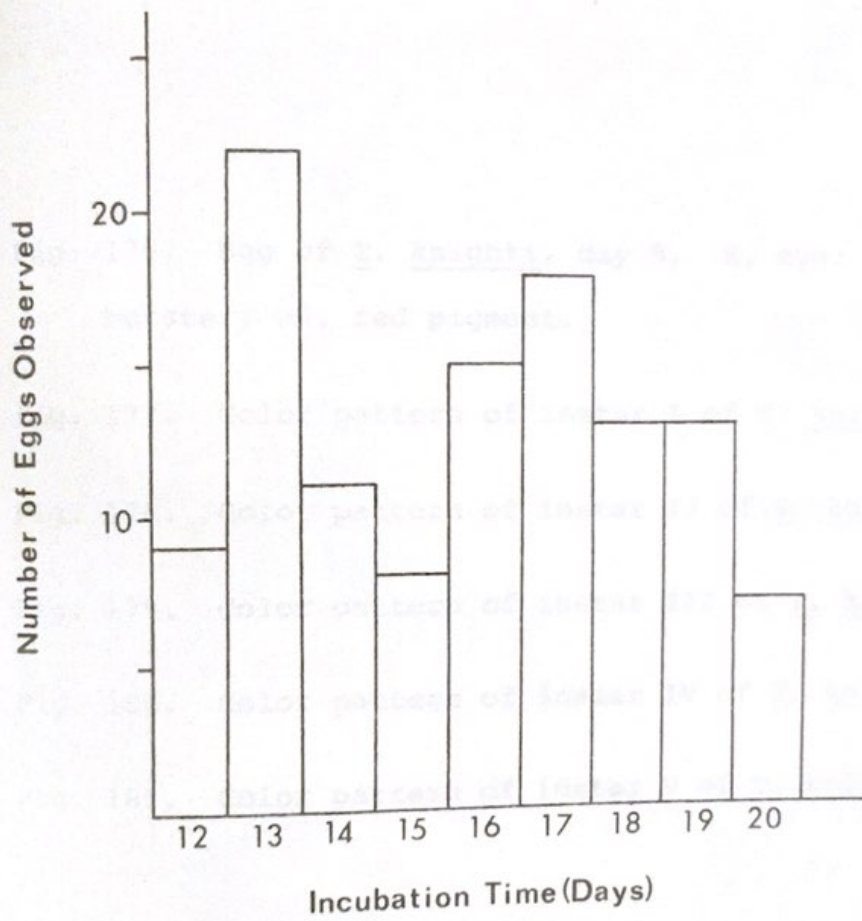


Fig. 175. Incubation time of eggs of T. knighti.

N = 115 eggs

\bar{x} = 15.9 days

range = 12-20 days



N= 116 eggs

\bar{x} = 15.8 days

range= 12-20 days

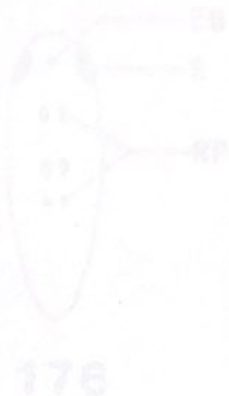


Fig. 176. Egg of T. knighti, day 9. E, eye; EB, egg burster; RP, red pigment.



Fig. 177. Color pattern of instar I of T. knighti.

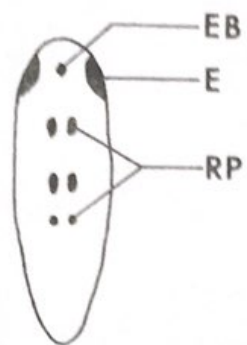
Fig. 178. Color pattern of instar II of T. knighti.

Fig. 179. Color pattern of instar III of T. knighti.

Fig. 180. Color pattern of instar IV of T. knighti.

Fig. 181. Color pattern of instar V of T. knighti.





176



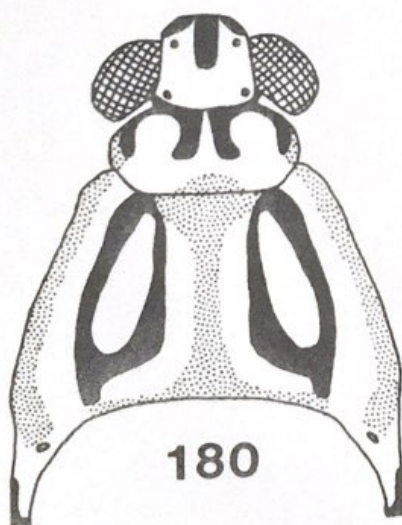
177



178



179



180



181

0.5 mm

Instar	Instar					Total	Sex
	I	II	III	IV	V		
2014	3	4	8	7	14	36	♂
2015	7	8	8	8	16	47	♀
2016	1	4	2	9	11	27	♂
2017	3	4	7	10	16	40	♂
2018	3	6	7	11	13	40	♀

Table 3. Duration (in days) of nymphal instars of two male and nine female T. knighti.

and nine female <u>T. knighti</u> .	10	33	45			
2025	6	9	37			
2026	7	13	50			
2027	7	14	40			
2028	5	13	39			
2029	7.3	5.6	9.7	9.8	14.2	43.4
2030	6-8	4-9	5-10	7-13	12-19	37-50

<u>Specimen</u>	<u>Instar</u>					Total	Sex
	I	II	III	IV	V		
KN13	8	4	6	7	14	39	f
KN19	7	6	6	8	16	43	f
KN21	7	4	7	9	13	40	f
KN22	8	4	7	10	16	45	m
KN23	8	6	7	11	13	45	f
KN24	8	6	10	12	14	50	f
KN25	7	8	8	10	13	46	f
KN26	6	6	5	8	12	37	f
KN28	7	6	6	13	18	50	m
KN30	7	6	6	7	14	40	f
KN31	7	5	6	8	13	39	f
mean	7.3	5.5	6.7	9.4	14.2	43.1	
range	6-8	4-8	5-10	7-13	12-18	37-50	

Table 4. Ranges and means of measurements (in mm) of
antennal and leg segments of five male and five female
T. knighti exuviae.

Segment	Instar				
	I	II	III	IV	V
antennal 1	0.12-0.14 (0.13)	0.17-0.19 (0.18)	0.25-0.28 (0.26)	0.37-0.45 (0.42)	0.56-0.70 (0.61)
antennal 2	0.06-0.08 (0.07)	0.08-0.11 (0.10)	0.13-0.16 (0.15)	0.20-0.24 (0.22)	0.30-0.38 (0.34)
antennal 3	0.06-0.08 (0.07)	0.07-0.10 (0.08)	0.10-0.14 (0.12)	0.17-0.24 (0.21)	0.27-0.41 (0.33)
antennal 4	0.18-0.20 (0.19)	0.23-0.26 (0.25)	0.30-0.34 (0.32)	0.38-0.44 (0.42)	0.49-0.56 (0.52)
total ant.	0.44-0.49 (0.47)	0.57-0.65 (0.61)	0.81-0.89 (0.85)	1.17-1.35 (1.27)	1.68-2.00 (1.79)
fore femur	0.20-0.24 (0.22)	0.30-0.32 (0.31)	0.42-0.46 (0.44)	0.58-0.67 (0.63)	0.78-0.96 (0.90)
fore tibia	0.18-0.23 (0.21)	0.27-0.30 (0.28)	0.35-0.41 (0.38)	0.49-0.55 (0.53)	0.67-0.84 (0.74)
fore tarsus	0.11-0.14 (0.13)	0.15-0.17 (0.16)	0.17-0.21 (0.20)	0.26-0.29 (0.28)	0.35-0.43 (0.42)
fore leg total	0.51-0.59 (0.55)	0.72-0.77 (0.75)	0.97-1.06 (1.03)	1.33-1.51 (1.44)	1.86-2.20 (2.06)

Segment	Instar				
	I	II	III	IV	V
middle femur	0.44-0.48 (0.45)	0.61-0.66 (0.63)	0.83-0.93 (0.88)	1.10-1.28 (1.21)	1.48-1.74 (1.68)
middle tibia	0.76-0.82 (0.78)	1.03-1.14 (1.08)	1.44-1.55 (1.50)	1.91-2.17 (2.05)	2.41-3.07 (2.82)
middle tarsus	0.55-0.58 (0.56)	0.73-0.77 (0.75)	0.96-1.00 (0.97)	1.25-1.39 (1.29)	1.48-1.86 (1.72)
middle leg total	1.76-1.87 (1.80)	2.39-2.54 (2.47)	3.24-3.45 (3.35)	4.26-4.84 (4.55)	5.36-6.64 (6.21)
hind femur	0.41-0.46 (0.44)	0.63-0.69 (0.65)	0.89-0.99 (0.94)	1.28-1.45 (1.36)	1.80-2.06 (1.95)
hind tibia	0.35-0.39 (0.37)	0.46-0.52 (0.49)	0.62-0.68 (0.65)	0.81-0.93 (0.87)	1.01-1.25 (1.17)
hind tarsus	0.27-0.31 (0.29)	0.34-0.38 (0.36)	0.44-0.46 (0.45)	0.55-0.64 (0.59)	0.72-0.90 (0.82)
hind leg total	1.06-1.17 (1.10)	1.45-1.58 (1.50)	1.96-2.10 (2.04)	2.70-2.99 (2.82)	3.54-4.14 (3.95)

Trepobates pictus

Preoviposition Period.— Five virgin females that had just molted to the adult stage were placed with males and three of these produced eggs in seven days, one in five days, and one in 12 days.

Oviposition.— Egg-laying took place in much the same manner as with T. subnitidus. Egg masses were very similar to those of T. subnitidus (Fig. 165), but the holdfast substance by which the eggs were attached was more milky in color than in T. subnitidus or knighti.

Number of Eggs/Mass and Fecundity.— The mean number of eggs/mass for 195 egg masses was 2.4 eggs, with a range of 1-10 (Fig. 182). This mean was similar to that for T. knighti (2.2) but distinctly smaller than for T. subnitidus (3.5). Seven females produced the following number of eggs in the given number of days: 29 (24 days), 36 (24 days), 37 (14 days), 40 (20 days), 79 (38 days), 89 (41 days), and 113 (51 days).

Viability and Incubation Period.— The development of 103 eggs was observed and 97 (94%) hatched. The mean incubation time of 97 eggs was 15.5 days (13-21 days) (Fig. 183) and was similar to the incubation time for T. knighti (15.8 days).

Egg Size, Shape, and Color.— The mean length of 100 eggs was 1.03 mm (0.96-1.09 mm), and the mean width was 0.29 mm (0.25-0.33 mm). The mean length of T. pictus eggs

was somewhat larger than the mean length of the eggs of T. subnitidus (0.95 mm) or knighti (0.96 mm). No significant changes in egg size were observed during development. Egg shape and color were similar to T. subnitidus except for the absence of pigmented areas (see below).

Egg Development.— No significant developmental changes were observed during day 1, but yolk globules were visible during days 2-4. The red eyes were first apparent at the posterior end on day 5 or 6, and these moved to the anterior end in 24-48 hours. Clear, transverse bands, not observed in the eggs of T. subnitidus or knighti, were seen near the posterior ends of some eggs on days 3-5. As shown in Fig. 184, T. pictus eggs did not develop spots of red pigment like those observed for T. subnitidus and knighti. The egg burster was first visible on day 7 but did not appear in some eggs until day 8 or 9. Days 10-12 were marked by a darkening of the red eye pigment. The hatching time was quite variable (13-21 days), but during the last days of development all eggs developed sooty pigmentation and the legs and antennae became apparent.

Eclosion.— This process was similar to that of T. subnitidus except that some of the nymphs could not break through the surface film, a problem also noted for T. browni and knighti.

Nymphs.— Data on the duration of each instar are given in Table 5 (N=13). The mean duration and range of each instar were as follows: I— 5.9 days (5-6), II— 7.5

days (5-11), III— 9.9 days (8-16), IV— 9.2 days (8-10), and V— 10.6 days (8-14). The mean number of days required for completion of all nymphal stages was 43 (40-50, N=13). Antennal and leg segment measurements of exuviae from each instar are presented in Table 6.

First Instar: Dark brown markings on head as in Fig. 185. Antennae: segment 1 light in color, with a single long, dark hair at dorsal apex; 2 light brown, with a hair similar to segment 1; 3 pale at base, light brown apically; 4 light brown. Rostrum light brown, fourth segment darker. Paired dark markings on pronotum (Fig. 185). Propleuron with a patch of brown pigment. All legs light brown. Mesonotum with a large pair of dark markings (Fig. 185), mesosternum with a very small pair of brown spots along anterior margin, these spots extending onto mesopleuron. Mesopleuron with a large brown area posteriorly. Metanotum with a pair of dark brown spots. Meta-acetabulum with a brown patch dorsally and laterally. Abdominal tergite 1 with paired, transverse brown spots; remaining tergites with paired, rectangular brown spots.

Second Instar: Head marked as in Fig. 186, slightly variable. Antennae: basal one-half pale, apical one-half brown, with a single short dark hair at dorsal apex; 2 brown, with a hair similar to segment 1; 3 pale at base, brown elsewhere; 4 brown. Segment 1 of rostrum with a triangular brown spot on dorsum; 2 mostly pale; 3 brown; 4 dark brown. Pronotum with paired dark markings (Fig. 186). Propleuron

with a very small brown spot. All legs brown, hind femur with three darker spots on dorsum. Mesonotum marked as in Fig. 186. Mesosternum, mesopleuron, metanotum, and meta-acetabulum similar to first instar. Abdominal tergites 1 and 2 with paired brown spots, remaining tergites with paired, transverse, and very thin brown markings. Abdominal tergites also with large, paired pale areas.

Third Instar: Dark brown markings on head (Fig. 187) slightly variable. Antennae similar to second instar. Rostrum similar to second instar except segment 4 black. Paired dark markings on pronotum (Fig. 187). Propleuron as in second instar. Fore femur mostly pale, tibia brown at base and apex, tarsus brown. Mesonotum patterned as in Fig. 187. Mesosternum and mesopleuron as in first instar. Middle femur light brown, tibia and tarsus brown. Metanotum with pairs of dark brown and light spots. Meta-acetabulum with a large brown spot laterally and a very small spot dorsally. Hind femur with three small brown spots dorsally, tibia and tarsus brown. Abdominal tergites similar to second instar except brown spots on posterior tergites barely visible.

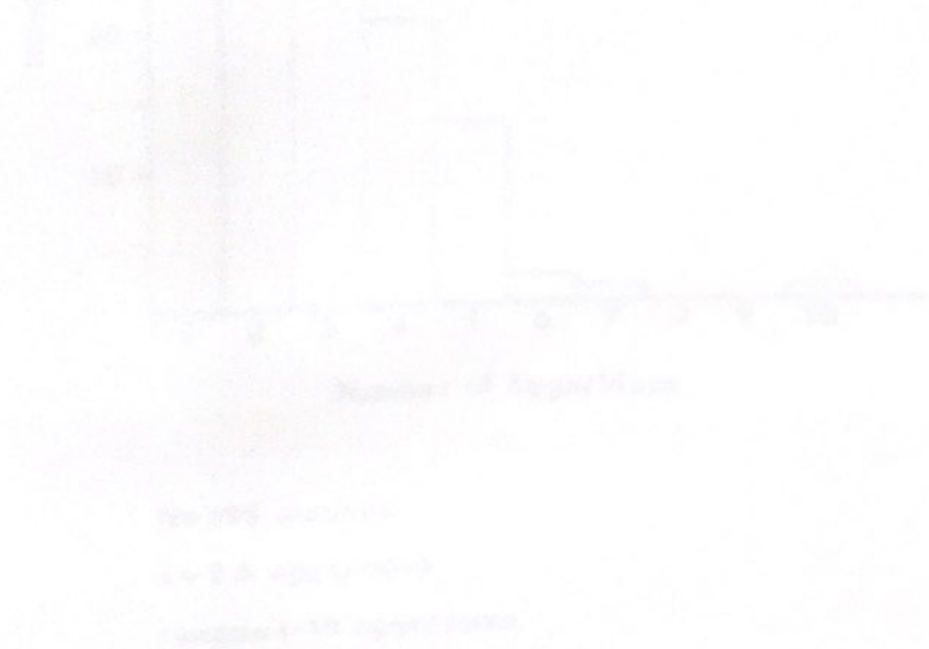
Fourth Instar: Dark brown markings on head (Fig. 188). Antennae similar to second instar except for absence of short, dark hairs on first and second segments. Rostrum similar to third instar. Pronotal markings shown in Fig. 188. Propleuron as in second instar. Fore femur with an indistinct brown stripe posteriorly; tibia and tarsus as in third instar. Mesonotum patterned as in Fig. 188. Meso-

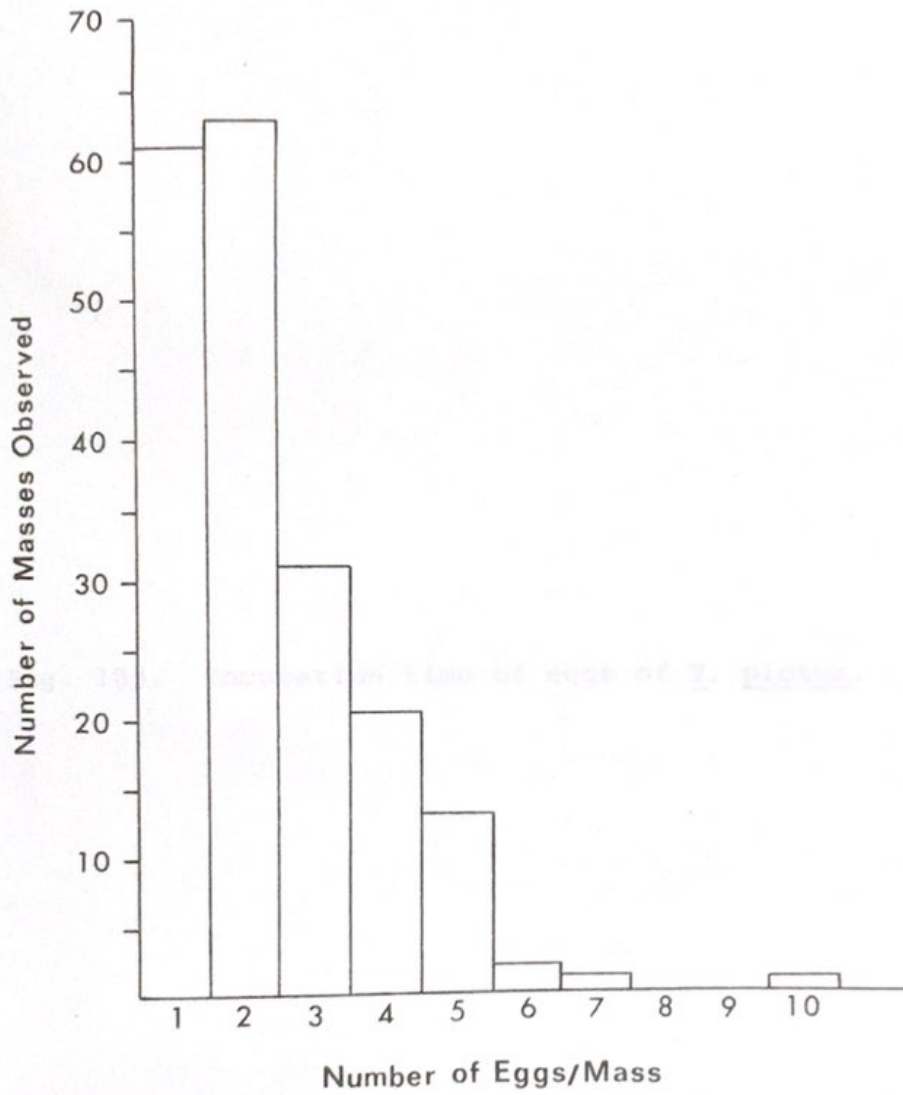
sternum and mesopleuron as in first instar. Middle femur with brown stripes along dorsal and posterior margins; tibia and tarsus brown. Metanotum, meta-acetabulum, hind legs, and abdominal tergites similar to third instar.

Fifth Instar: Head marked with dark brown (Fig. 189). Antennae as in fourth instar. Rostrum similar to third instar. Pronotal markings shown in Fig. 189. Propleuron as in second instar. Fore legs similar to fourth instar. Mesonotum patterned as in Fig. 189. Mesosternum and mesopleuron similar to first instar. Middle legs as in fourth instar. Metanotum, meta-acetabulum, and hind legs similar to third instar. Abdominal tergites similar to third instar except dark markings longitudinal on posterior tergites.

Ecdysis.— This process was similar to that observed for T. subnitidus, but many nymphs of T. pictus experienced difficulty shedding their exuviae.

Fig. 182. Number of eggs/mass for T. pictus.





N= 195 masses

\bar{x} = 2.4 eggs/mass

range= 1-10 eggs/mass

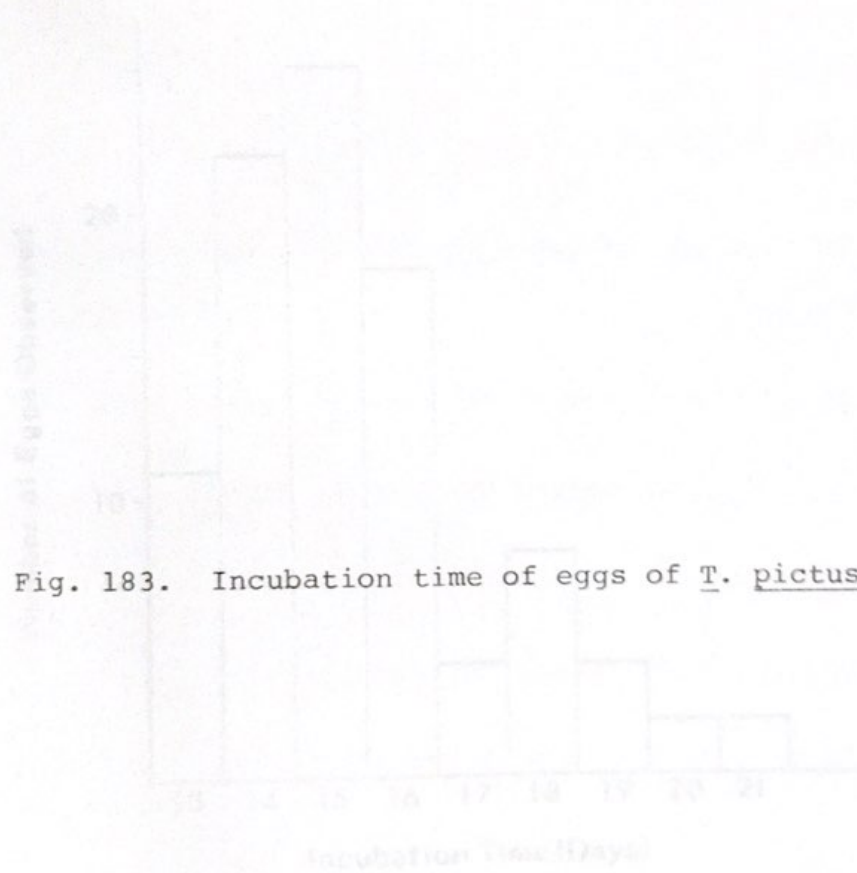
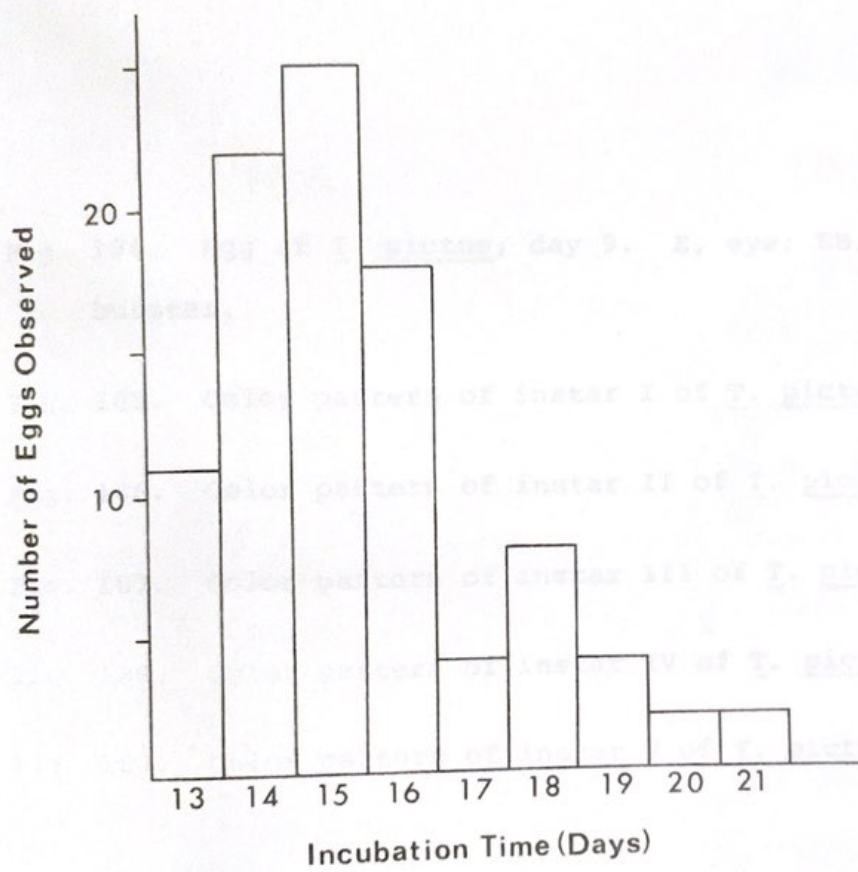


Fig. 183. Incubation time of eggs of *T. pictus*.

$N = 87$ eggs

$\bar{x} = 15.5$ days

range = 13-21 days



N= 97 eggs

\bar{x} = 15.5 days

range = 13-21 days



184



185

Fig. 184. Egg of T. pictus, day 9. E, eye; EB, egg burster.

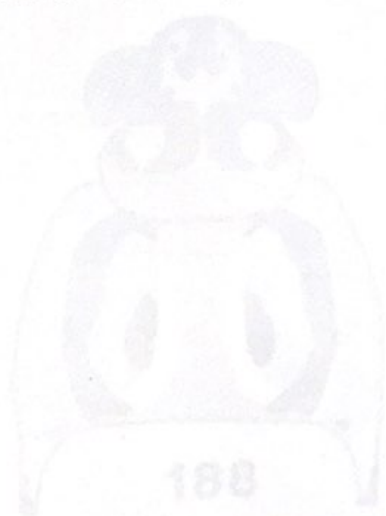
Fig. 185. Color pattern of instar I of T. pictus.

Fig. 186. Color pattern of instar II of T. pictus.

Fig. 187. Color pattern of instar III of T. pictus.

Fig. 188. Color pattern of instar IV of T. pictus.

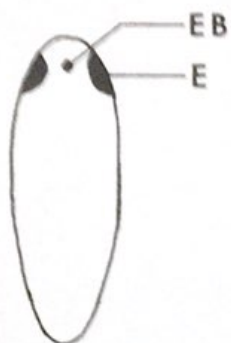
Fig. 189. Color pattern of instar V of T. pictus.



188



189



184



185



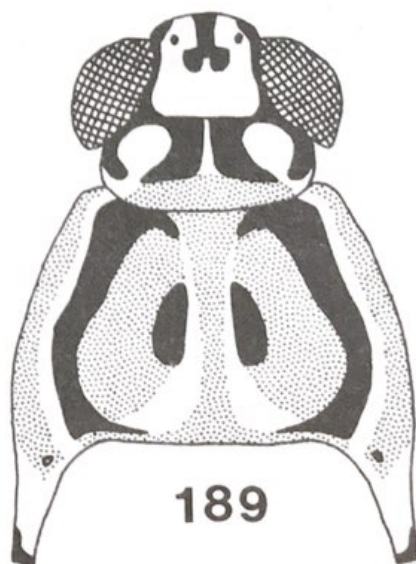
186



187



188



189

0.5 mm

Specimen	Instar					Total	Sex
	I	II	III	IV	V		
1413	5	6	14	10	14	50	♂
1415	5	9	9	10	9	41	♀
1416	5	7	10	9	9	41	♂
1422	5	9	10	9	9	40	♀
1423	5	9	9	8	13	45	♂
1425	5	8	8	10	9	40	♀

Table 5. Duration (in days) of nymphal instars of four male and nine female T. pictus.

1426	5	9	10	10	12	46	♂
1427	5	7	9	9	9	40	♀
1428	5	11	10	9	8	44	♂
1429	5	11	8	9	10	44	♀
1430	5	5	9	8	12	41	♀
Mean	5.9	7.5	9.8	9.2	10.6	43.0	
Range	5-6	5-11	8-16	8-10	8-14	40-50	

<u>Specimen</u>	<u>Instar</u>					Total	Sex
	I	II	III	IV	V		
PN19	5	5	16	10	14	50	f
PN20	5	9	9	10	9	42	f
PN21	6	7	10	9	9	41	m
PN22	6	6	10	9	9	40	f
PN23	6	9	9	8	13	45	m
PN25	6	7	8	10	9	40	f
PN26	6	7	11	9	12	45	f
PN28	6	7	10	9	12	44	m
PN29	6	5	10	10	12	43	f
PN30	6	7	9	9	9	40	f
PN31	6	11	10	9	8	44	m
PN32	6	11	8	9	10	44	f
PN33	6	6	9	8	12	41	f
mean	5.9	7.5	9.9	9.2	10.6	43.0	
range	5-6	5-11	8-16	8-10	8-14	40-50	

Table 6. Ranges and means of measurements (in mm) of antennal and leg segments of five male and five female T. pictus exuviae.

<u>Segment</u>	<u>Instar</u>				
	I	II	III	IV	V
antennal 1	0.13-0.15 (0.14)	0.19-0.22 (0.21)	0.27-0.30 (0.28)	0.37-0.44 (0.41)	0.58-0.73 (0.64)
antennal 2	0.07-0.11 (0.08)	0.09-0.11 (0.10)	0.14-0.17 (0.15)	0.20-0.24 (0.22)	0.32-0.38 (0.35)
antennal 3	0.06-0.10 (0.07)	0.08-0.11 (0.10)	0.12-0.14 (0.13)	0.15-0.23 (0.21)	0.28-0.38 (0.33)
antennal 4	0.18-0.20 (0.19)	0.23-0.25 (0.24)	0.28-0.32 (0.30)	0.37-0.41 (0.38)	0.46-0.54 (0.49)
total ant.	0.46-0.56 (0.49)	0.62-0.67 (0.64)	0.83-0.91 (0.87)	1.13-1.27 (1.22)	1.68-1.96 (1.81)
fore femur	0.21-0.24 (0.23)	0.31-0.34 (0.32)	0.42-0.46 (0.45)	0.61-0.67 (0.63)	0.87-0.99 (0.92)
fore tibia	0.21-0.24 (0.22)	0.28-0.30 (0.29)	0.38-0.42 (0.40)	0.49-0.55 (0.53)	0.67-0.78 (0.72)
fore tarsus	0.11-0.14 (0.13)	0.15-0.17 (0.16)	0.19-0.21 (0.20)	0.26-0.29 (0.28)	0.40-0.43 (0.41)
fore leg total	0.54-0.61 (0.58)	0.75-0.79 (0.77)	1.01-1.10 (1.05)	1.39-1.51 (1.44)	2.00-2.17 (2.05)

<u>Segment</u>	<u>Instar</u>				
	I	II	III	IV	V
middle femur	0.46-0.49 (0.48)	0.64-0.66 (0.65)	0.83-0.92 (0.87)	1.10-1.22 (1.15)	1.48-1.71 (1.57)
middle tibia	0.75-0.77 (0.76)	1.03-1.06 (1.04)	1.34-1.44 (1.39)	1.83-2.06 (1.92)	2.46-3.01 (2.71)
middle tarsus	0.56-0.58 (0.57)	0.72-0.76 (0.74)	0.89-0.99 (0.93)	1.16-1.30 (1.23)	1.51-1.77 (1.63)
middle leg total	1.79-1.83 (1.81)	2.39-2.46 (2.44)	3.07-3.34 (3.18)	4.12-4.58 (4.31)	5.45-6.49 (5.90)
hind femur	0.45-0.47 (0.46)	0.65-0.68 (0.66)	0.85-0.97 (0.90)	1.22-1.33 (1.28)	1.71-2.03 (1.84)
hind tibia	0.36-0.38 (0.37)	0.46-0.48 (0.47)	0.56-0.63 (0.60)	0.75-0.84 (0.80)	1.01-1.19 (1.09)
hind tarsus	0.28-0.30 (0.29)	0.35-0.37 (0.36)	0.42-0.46 (0.44)	0.55-0.61 (0.57)	0.70-0.81 (0.76)
hind leg total	1.11-1.14 (1.12)	1.48-1.52 (1.50)	1.85-2.06 (1.94)	2.52-2.78 (2.65)	3.42-4.03 (3.68)

SUMMARY

This revision of the genus Trepobates is based upon the examination of over 16,000 specimens obtained by personal collection and through loans from many institutions and individuals. Life history information was obtained for three species through laboratory rearing.

The genus Trepobates presently includes 12 species, including two which were previously undescribed. The various species are common inhabitants of a wide variety of lentic and lotic habitats throughout the range of the genus. They have been commonly collected in association with Rheumatobates spp., Gerris spp., and Limnogonus spp. Species which occupy temperate regions are found from spring through autumn and apparently overwinter in the egg stage. However, in tropical or subtropical areas, Trepobates spp. are found during all seasons. Food apparently consists primarily of adult aquatic and terrestrial arthropods which have fallen into the water. Wing dimorphism occurs in all species, but the apterous morph usually predominates. The various species occur in southern Canada, eastern and southwestern United States, Central America, northern South America, and the West Indies.

T. becki is a fairly common species which inhabits both lotic and lentic habitats. Specimens have been collected

throughout the year, and the apterous form predominates. The range of T. becki extends from California and Arizona in the United States southward throughout much of Mexico.

T. floridensis is the smallest member of the genus and has a restricted range in the southeastern United States. It has been collected from a wide variety of aquatic habitats and is locally common. This water strider has been collected during most of the year; macropterous specimens are rare.

T. inermis is a fairly common water strider which is almost entirely restricted to lotic habitats. It has only been collected from June through October, and the macropterous form is rare. T. inermis is known from much of the eastern United States and Ontario, Canada.

Most females of T. knighti examined had long connexival spines, but specimens with short spines from Illinois, Iowa, Missouri, and Oklahoma and without spines from Illinois and Indiana were seen during this study. T. knighti is a common species throughout much of its range and is confined primarily to lotic habitats. Collection records exist from May through November. Macropterous specimens are very rare. This water strider has only been collected in the central United States.

T. n. sp. 1 is a distinct species which has been collected during most of the year and only from lotic habitats. The macropterous form is uncommon. This gerrid is known only from western and southern Mexico.

T. n. sp. 2 most closely resembles T. pictus but can be separated from the latter species by a number of characters.

It has been collected from a variety of lentic and lotic habitats throughout most of the year. The macropterous form is fairly common. The range of this species extends from southern Texas to Honduras and includes Cuba and Jamaica.

T. panamensis has been collected more commonly from lotic habitats but also inhabits lakes and ponds. Collection records are known for each month except November. The macropterous form is fairly common. T. panamensis ranges from Mexico south to northern South America.

T. pictus is not an abundant species in general but may be locally common. It has been most commonly collected from lotic habitats but also occurs on ponds. T. pictus has been collected from April through December. The macropterous form of this water strider is rare. It has a wide distribution throughout the eastern one-half of the United States and is also known from southern Canada.

T. subnitidus has been frequently confused with other Trepobates in the literature and collections, and T. citatus is herein considered to be a synonym of T. subnitidus. Although most specimens of female T. subnitidus do not have connexival spines, females of some populations have long connexival spines strikingly similar to T. knighti. T. subnitidus is the most common species of Trepobates in the eastern United States and is often abundant in a wide variety of lotic and lentic habitats. Most records of this species are from May through October, but it has been collected from November through February in the southern United States.

The winged morph is most uncommon. The range of this species covers the eastern one-half of the United States and southern Canada.

T. taylori is apparently a common species throughout much of its range and occurs in a wide variety of lotic and lentic habitats. It has been collected each month of the year. The macropterous morph is quite common. T. taylori is widely distributed in Mexico, Central America, northern South America, the West Indies, and the southern United States (Texas).

T. trepidus is apparently a common species throughout much of its range. Although recorded from both lentic and lotic habitats, the great majority of records are from creeks and rivers. It has been collected throughout the year and the macropterous form is quite common. T. trepidus is widely distributed from Arizona southward through Mexico and Central America and into northern South America.

T. vazquezae may be locally abundant and occurs on brackish and fresh-water habitats. It has been collected in April, June, July, August, and November. The majority of specimens observed were macropterous. T. vazquezae has a restricted range along the Pacific Coast of Mexico.

Following a study of taxa closely related to Trepobates, ancestral and derived states for 12 characters were proposed. Based on the information concerning the ancestral and derived states of characters in the genus Trepobates, it was possible to postulate some of the characters of the

progenitor of this genus and to postulate the phylogenetic relationships among the extant species.

Life history studies on three species, T. subnitidus, knighti, and pictus, were conducted in the laboratory. All three species deposited eggs on floating corks or bits of styrofoam. Eggs were always vertically oriented and were attached by a translucent holdfast substance. Eggs of T. subnitidus and knighti developed spots of red pigment not seen in the eggs of T. pictus. Emerging nymphs left the eggs through a ventral split which extended anteroposteriorly for about one-half to two-thirds of the length of the egg. Ecdysis was initiated by the splitting of the cuticle at ecdysial lines on the head, dorsal midline of the thorax, and sometimes on the first few abdominal segments. The head emerged first, followed by the thorax, abdomen, and appendages. Five instars occurred in all three species.

The mean number of eggs/mass for T. subnitidus was 3.5 eggs, with a range of 1-10. The mean incubation time of the eggs was 14.6 days, with a range of 13-16 days. The mean length of the eggs was 0.95 mm and the mean width was 0.26 mm. The mean number of days required for completion of the five nymphal stages was 38.5 (35-41).

The mean number of eggs/mass for T. knighti was 2.2 eggs, with a range of 1-8. The mean incubation time of the eggs was 15.8 days (12-20). The mean length of the eggs was 0.96 mm and the mean width was 0.28 mm. The mean number of days required for completion of the five instars was 43.1 (37-50).

The mean number of eggs/mass for T. pictus was 2.4 eggs, with a range of 1-10. The mean incubation time of the eggs was 15.5 days (13-21). The mean length of the eggs was 1.03 mm and the mean width was 0.29 mm. The mean number of days required for completion of the five instars was 43 (40-50).

The major objective of this investigation was to provide a revision of the genus Trepobates which includes taxonomy, morphology, biology, distribution, and phylogeny of the group. The present paper brings up to date the available information on the systematics of Trepobates and hopefully will stimulate interest for this group in the future.

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Abstract of dissertation submitted in partial fulfillment
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ABSTRACT

This investigation was based upon the examination of 16,136 preserved specimens, personal field observations, and laboratory rearing. Twelve species in the genus Trepobates are recognized from the Western Hemisphere in this revision. Two new species are described and T. citatus is considered a synonym of T. subnitidus. A generic description, keys to the sexes and species, descriptions and measurements, natural history information, locality records, illustrations of pertinent anatomical features, and a discussion of the phylogenetic relationships of the 12 species are presented. The life histories of T. subnitidus, knighti, and pictus are described based upon laboratory rearing.